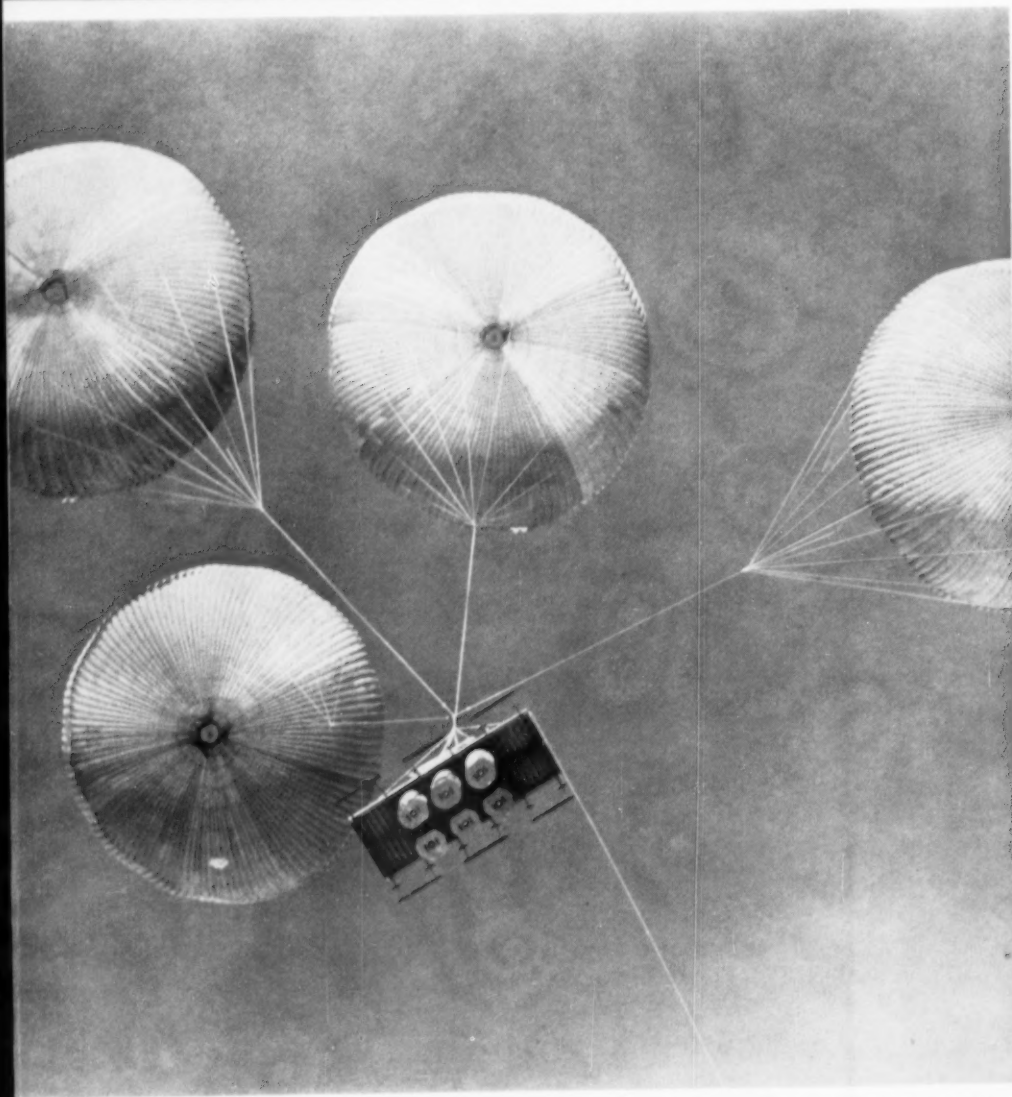


Compressed Air

APRIL 1956

Magazine

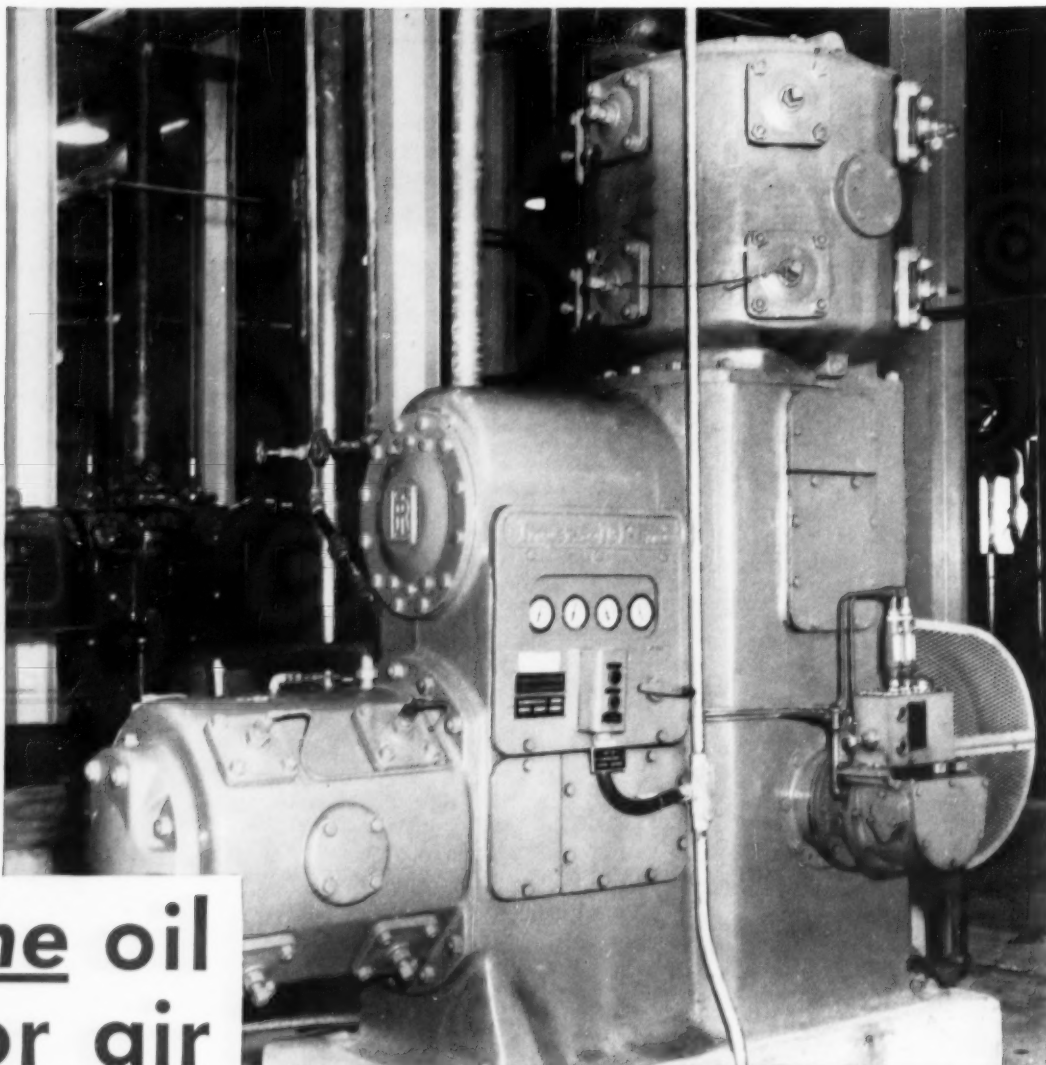


PNEUMATIC FEET
SOFTEN LANDING
Turn to index page to see
what happens when the
load strikes ground

PHOTO, THE FIRESTONE TIRE & RUBBER COMPANY

VOLUME 61 • NUMBER 4

NEW YORK • LONDON



The oil for air

FOR dependable air compressor operation, *the* oil to use is *Texaco Regal Oil R&O*. Its premium quality, plus effective additives, assures *clean* compressor systems — no rust, no harmful deposits. Rings stay free, valves function properly. You get smooth, trouble-free performance . . . and your maintenance costs come down.

There is a complete line of *Texaco Regal Oils R&O* to meet the requirements of all types and

sizes of compressors, all operating conditions.

Let Texaco Lubrication Engineering Service help you select the one exactly right to assure most efficient operation of your compressors. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street,
New York 17, N. Y.



TEXACO Regal Oils R & O
FOR ALL AIR COMPRESSORS AND OPERATING CONDITIONS

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Circle 1A on reply card

STAYNEW

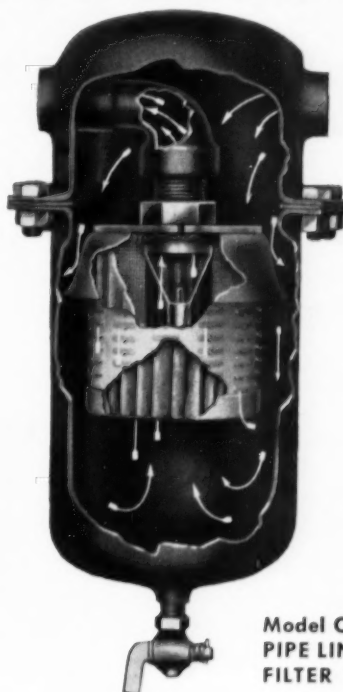
PIPE LINE FILTERS

FOR
**CLEAN
DRY
AIR**
IN

- AIR OPERATED INSTRUMENTS
- AIR OPERATED TOOLS
- PNEUMATIC CONTROLS
- INDUSTRIAL PROCESSES

MODEL CPH PIPE LINE FILTER has exclusive Staynew "double action principle." Air is first deflected to outer walls of filter and forced downward at high speed. Water, oil and heavier particles of rust, etc., are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter airborne particles. This double action design eliminates need for frequent cleaning.

Inexpensive, simple to install and maintain, Staynew Pipe Line Filters keep your



**Model CPH
PIPE LINE
FILTER**

air-operated equipment free from the destructive effects of pipe scale, dust, dirt, and condensates. And, Staynew Filters pay for themselves in reduced equipment maintenance costs alone. They filter compressed air under all pressures and temperatures, natural and manufactured gases. Dollinger engineers will welcome your filtration problems. Why not call on us. Remember, Dollinger makes every type of filter for every industrial need.



DOLLINGER
CORPORATION

**ALL TYPES OF FILTERS FOR
EVERY INDUSTRIAL NEED**



**INTAKE
FILTERS**



**LIQUID
FILTERS**



**PIPE LINE
FILTERS**



**ELECTRO-
STAYNEW
PRECIPITATOR**



**AUTOMATIC
AIR
FILTERS**



**PANEL
FILTERS**



**SPECIAL
FILTERS**

Write for Bulletin 200 which contains complete engineering data and illustrated material on Staynew Pipe Line Filters. Dollinger Corporation, Dept. 7, Centre Park, Rochester 3, N. Y.

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS
ELECTROSTATIC FILTERS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS
VISCIOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS
AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

10 Ingersoll-Rand turbo-compressors now serving

Creole's outstanding offshore repressuring plant

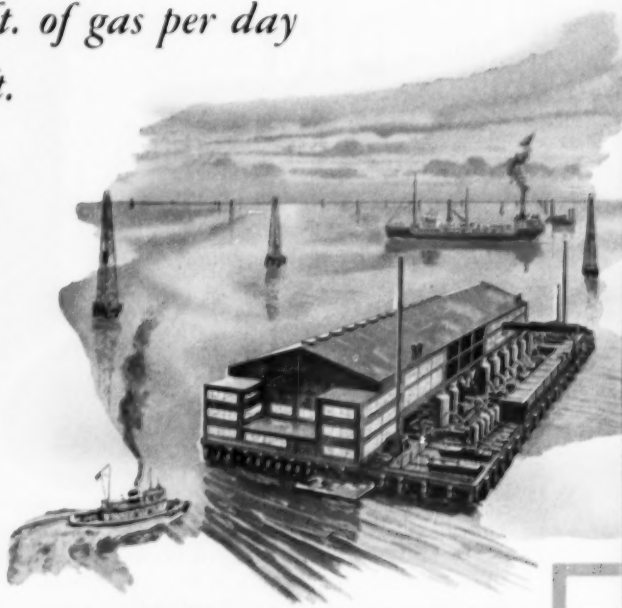
Increase oil recovery from Lake Maracaibo reservoir*

Arranged in 7 stages of compression, ten I-R Compressors are delivering 137,000,000 cu. ft. of gas per day at 2,000 psi to oil pools 4,500 ft. underneath the lake

CREOLE PETROLEUM CORPORATION's huge \$20 million gas-compression plant is the largest gas conservation project so far completed in Venezuela. Located on a pile-supported platform in Lake Maracaibo, it represents a bold concept in pressure maintenance for pushing petroleum up from a reservoir 4500 feet underneath the lake.

One of the plant's innovations is the use of 10 I-R multi-stage centrifugal compressors, specially designed for this outstanding project. Arranged in 7 stages of compression, the compressors are driven by 60,000 hp of combustion-gas-turbines. Handling gas from the lake's well heads, they compress it from 10 to nearly 2000 psi—the highest operating pressure ever attained with centrifugal compressors—and then force the gas back into the ground.

For information on these or any other Ingersoll-Rand air and gas compressors or blowers, contact your nearest I-R engineer.



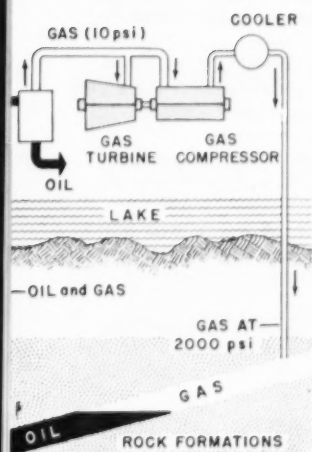
* **A**TTESTING the efficiency, economy and dependability of I-R equipment in such continuous, heavy-duty service, 12 more I-R compressors have been ordered for still another and larger repressuring plant on Maracaibo which Creole is now constructing.



Ingersoll-Rand

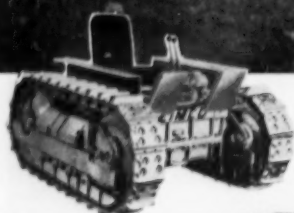
11 Broadway, New York 4, N. Y.

12-392



Simplified flow diagram of Creole's gas pressure maintenance plant.

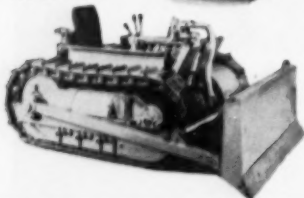
10 gas-turbine-driven Ingersoll-Rand centrifugal compressors, passing gas through 7 stages of compression from 10 to 2000 psi.



630 Tractor



630 Loader



630 Bulldozer

Load Trucks Faster Underground

Eimco 630 crawler loaders speed up the mucking cycle underground because they can load trucks or other haulage equipment from any angle at an average speed of three tons per minute.

The 630 provides new flexibility underground with crawler and rubber tired equipment operating in trackless headings. The 630 is also ideal for drawpoint loading in mines where track haulage is already operating.

Spreading fill or pushing broken rock in big stopes provides an ideal situation for the 630 with bulldozer attachment.

All of these applications make use of the Eimco 630 which is a heavy-duty air or electric powered unit providing maximum production efficiency with minimum cost in maintenance and operation.

The 630 is the answer to dependable trackless mining. An Eimco engineer will answer any questions you may have about this machine and arrange for you to see the 630 in operation.

THE EIMCO CORPORATION
Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash.
Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa



COPPUS "BLUE RIBBON" VENTILATORS

identified by the blue band

FOR WORKERS'

- Safety
- Health
- Comfort
- Efficiency

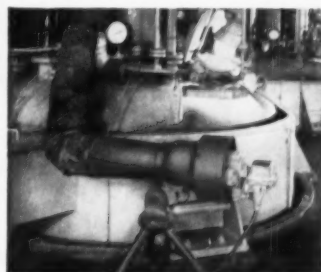
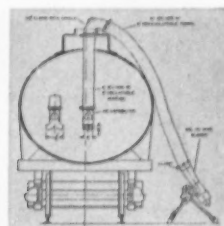
VANO® Design "A" VENTILATOR



Vano Design "A" cooling interior of furnace, supplying fresh air through 10 feet of "Ventube" to provide safety and comfort during repair work.

Vano Design "A" delivering fresh air to cable manhole, expelling sewer gas, making entrance safe in a few minutes.

Vano Design "A" Ventilator plus a few accessories feeds large air volume into tank car, driving out fumes, stagnant or hot air for workers' safety and comfort.



Vano Design "A" supplying fresh air in Reactor Room of Synthetic Rubber Plant.



Vano Design "A" Ventilator supplying fresh air to men working in wing compartments, fuselages, etc.

Powered by a 1/2 hp motor, and equipped with the exclusive Coppus axial-flow propeller-type fan, this general-purpose blower delivers 1500 CFM of fresh air. It supplies ventilation for tanks, tank cars, drums, vats, underground cable manholes, pipe galleries, airplane wing compartments and fuselages, and other confined places. Weighs only 103 lbs. Uses 8"-diameter flexible canvas tubing ("Ventube").

VANO DESIGN "C"

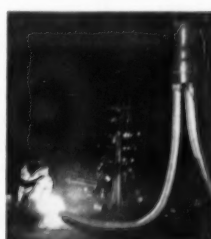


VENTILATOR-EXHAUSTER



Vano Design "C" equipped with 8" discharge tubing removing welding fumes.

Vano Design "C" equipped with two suction lines removing welding fumes for operators' safety.



For withdrawing welding fumes from confined places or directly from the welding rod ...or for expelling fumes or hot air from enclosed vessels. You can get it with 8" suction inlet for 8" non-collapsible tubing ...or with multiple inlet nozzles for 5", 4" or 3" suction hose. The discharge outlet takes 8" "Ventube". Powered by a 1/2 hp motor, it weighs only 85 lbs.

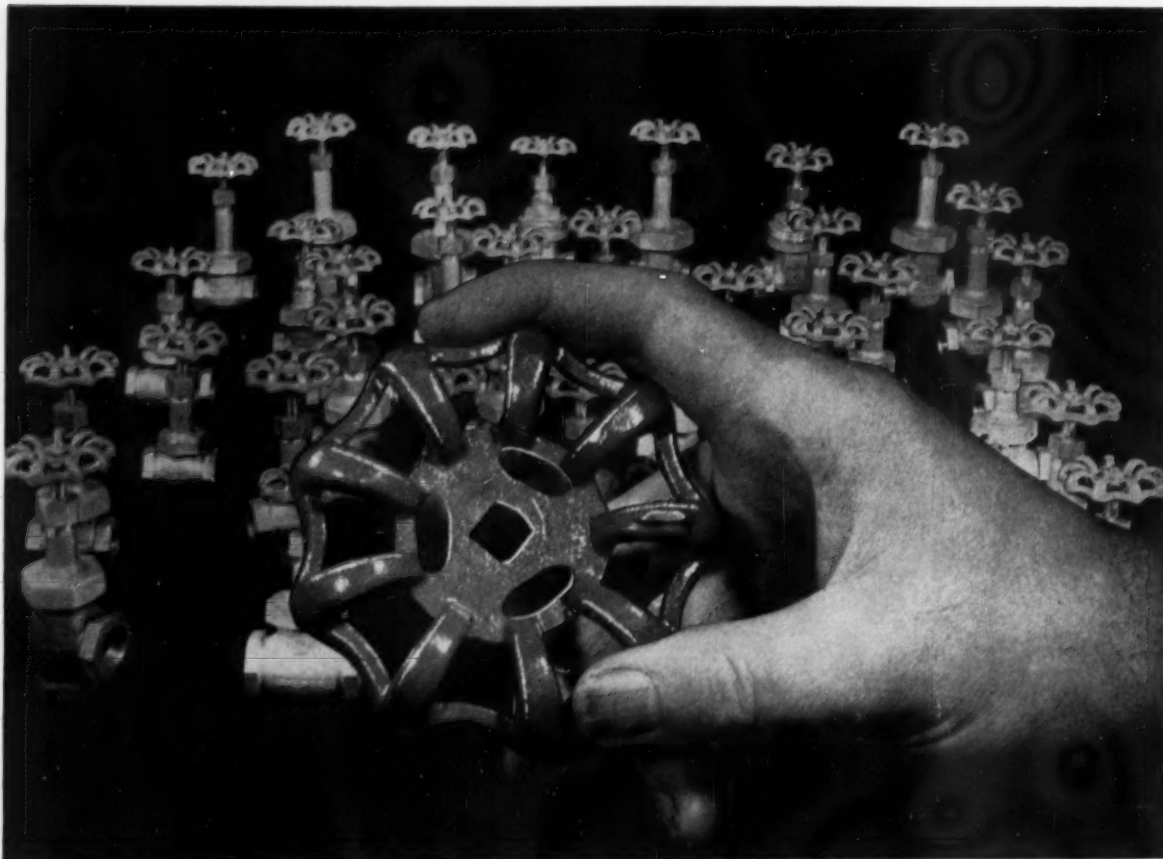
COPPUS ENGINEERING CORP., 204 PARK AVENUE, WORCESTER 2, MASS.
Please send information on the Blowers that clear the air for Action.

- | | | |
|--|--|---|
| <input type="checkbox"/> in tanks, tank cars, drums, etc. | <input type="checkbox"/> on steam-heated rubber processes. | <input type="checkbox"/> general man cooling. |
| <input type="checkbox"/> in underground cable manholes. | <input type="checkbox"/> on boiler repair jobs. | <input type="checkbox"/> around cracking stills. |
| <input type="checkbox"/> in aeroplane fuselages, wings, etc. | COOLING: | <input type="checkbox"/> exhausting welding fumes. |
| <input type="checkbox"/> on coke ovens. | <input type="checkbox"/> motors, generators, switchboards. | <input type="checkbox"/> stirring up stagnant air wherever men are working or material is drying. |
| | <input type="checkbox"/> wires and sheets. | |

(Write here any special ventilating problem you may have.)

NAME
COMPANY
ADDRESS
CITY

COPPUS "BLUE RIBBON" PRODUCTS—Designed for Your Industry, Engineered for You



One handwheel fits 39* different valves

***Walworth Handwheel No. 16
fits these
Walworth Bronze Valves:**

3/4"	No. 32, 40, 47, 48, 205, 206, 225P, 227P, 260, 261, 260P, 261P
1"	No. 29, 30, 36, 37, 91, 0X91, 92, 95, 96, 160, 161, 235, 236, 245, 246, 245P, 246P, 237P, 238P
1 1/4"	No. 58, 59
1 1/2"	No. 2, 3, 4, 11, 12, 14

**Only Walworth Bronze Valves give you
this degree of interchangeability**






With standardized Walworth Bronze Valve parts you maintain the greatest number of valves with the smallest inventory of basic parts. Handwheels are just one example. Fourteen different sizes of handwheels are all you need for fifty lines of gate, globe, and angle valves, involving 420 individual valves.

The Walworth system of interchangeability of parts for Bronze Valves is unsurpassed by any manufacturer in the field. In addition to Bronze Valves, Walworth produces valves and pipe fittings of iron, steel, special alloys, and rigid polyvinyl chloride (PVC).

Learn more about Walworth interchangeability. Contact your local Walworth Distributor or nearby Walworth Sales Office. Ask for literature.

WALWORTH

60 East 42nd Street, New York 17, New York

SUBSIDIARIES:  **ALLOY STEEL PRODUCTS CO.**  **CONOFLOW CORPORATION**  **M & H VALVE & FITTINGS CO.**
 **SOUTHWEST FABRICATING & WELDING CO., INC.**  **WALWORTH COMPANY OF CANADA, LTD.**

STANDARD OPEN DRIP-PROOF
LOUIS ALLIS MOTOR

PLASTIC SHIELD COVERS FLYWHEEL
TO PREVENT SPLASHING

MOTOR IMMERSED IN WATER

In water 1½ years...still running

Dramatic proof that Louis Allis motor insulation
provides unusual moisture resistance

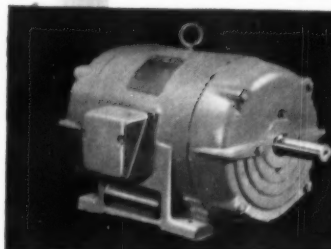
We wouldn't do this to a motor. But somebody did, to check our new insulation. They took a standard open drip-proof motor, placed it in water up to the shaft, and ran it a year and a half.

The motor will still run, too, which proves that our insulating materials are of top quality. One of our exclusive features is the new phenolic impregnating varnish we use. As you

can see, this varnish resists moisture, but it also has excellent thermal and chemical resistance and is not susceptible to embrittlement.

Insulation usually determines the life of a motor. That's why the insulating materials used in the new L. A. line are the product of years of continuous research and development. That's why Louis Allis motors run longer . . . give less trouble.

Find out the many other advantages available to you in the new L. A. line of motors. Write for our new bulletin No. 1700.



A complete line of standard rated motors in frames 182 through 326U now in stock. Special rated motors are available on short delivery.

LA-107

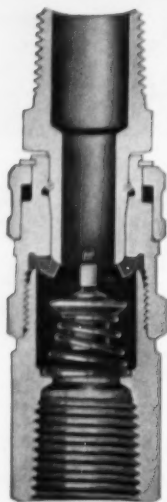


THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

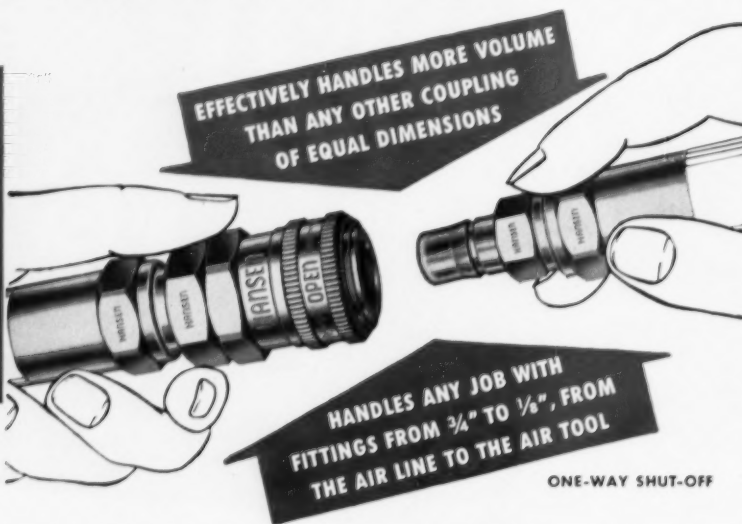
This is it!

**THE QUICK-CONNECTIVE PNEUMATIC COUPLING THAT
GIVES YOU THESE BIG ADVANTAGES**

HANSEN SERIES 3-RL RING-LOCK COUPLING



- Smaller — Lighter.
- All Series 3-RL Sockets and Plugs are interchangeable—reduces stock inventory to a minimum.
- Positive Locking.
- Equipped with automatic sleeve lock.



● Compactly designed, the Hansen Series 3-RL Coupling *effectively* handles far more volume than any coupling of equal dimensions. On any job requiring $\frac{3}{4}$ " to $\frac{1}{8}$ " connections—from the air line to the air tool—this single size Hansen Ring-Lock Coupling—with completely interchangeable Sockets and Plugs—does it all—makes it easy to keep stock of parts in balance—holds inventories to a minimum.

To connect, merely push Plug into Socket. To disconnect, just turn the sleeve. Locking ring provides positive lock and assures tight fit. Sockets with aluminum bodies are available for use with small hand-operated air tools.



Write for Descriptive Literature

THE HANSEN



MANUFACTURING COMPANY

4031 WEST 150th STREET

CLEVELAND 11, OHIO



Biggest Granite Quarry

Rock of Ages, at Barre, Vt., is the world's largest quarry for monumental granite. The opening covers an area of about 45 acres, and the quarry is so deep that, in parts, it could easily swallow a 27-story building. Geologists are of the opinion that the material extends into the earth for nearly 35 miles.

Rock of Ages granite is a dense, igneous type of rock, a premium material occurring not as strata but in the form of gigantic boulders which are irregular in shape. Throughout the quarry Bethlehem Hollow Drill Steel, 1 1/4 in. round and 1 in. hexagon, is used to release these boulders from the mass. Blasting, because of its shattering effect, is employed sparingly, and then only to remove rock which is not true memorial material.

Rock of Ages has a grain just like wood, and therefore must be cut either with the grain, or directly across it. Using Bethlehem Hollow, quarrymen drill a line of closely-spaced holes in one direction, then follow with holes at right angles

to the original line. Steel wedges are then inserted in the holes, and pounded evenly until the piece cracks.

At Rock of Ages, as well as in scores of other applications, Bethlehem Hollow Drill Steel is providing dependable, low-cost-per-foot-of-hole performance. This fine drill steel, rolled from a tough, fatigue-resisting steel, has a wide quenching range, making it easy to heat-treat for the ideal balance of hardness and wear-resistance. It also makes long-wearing threads and tough shanks.

Bethlehem Hollow is made in rounds, hexagons and quarter-octagons, and is generally furnished in lengths of 18 to 25 ft. Longer lengths can also be supplied. It's the ideal drill steel for your next rock-removal project.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL

**CARBON AND
ULTRA-ALLOY**



NEW!

Revolutionary AIRengineering Development by Ingersoll-Rand..

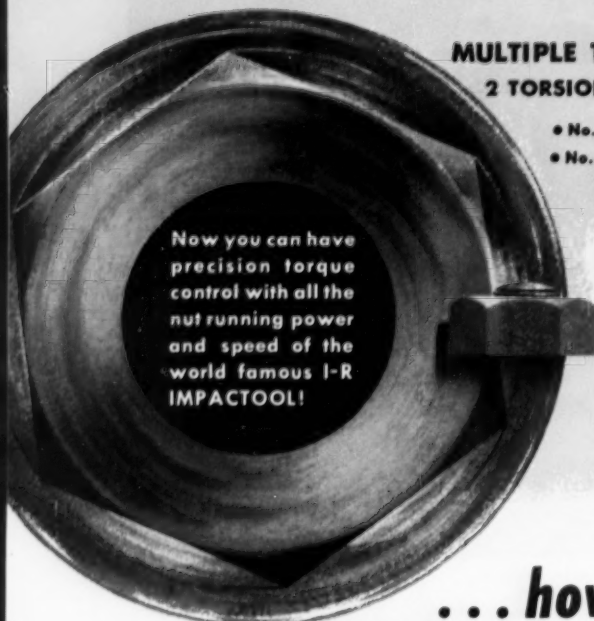


Torque control **IMPACTTOOLS**

MULTIPLE TORQUE SETTINGS

2 TORSION BARS AVAILABLE:

- No. L735. Max. torque 60 ft. lbs.
- No. H735. Max. torque 90 ft. lbs.



Now you can have
precision torque
control with all the
nut running power
and speed of the
world famous I-R
IMPACTOOL!



Size 5040T*

*For torques up to 550 ft. lbs., a Size
5340T Torque Control Impactool is available

... how can YOU use these
ADVANTAGES ON NUT RUNNING JOBS
where prescribed torques must be met?

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.



Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress in the preset torsion bar.

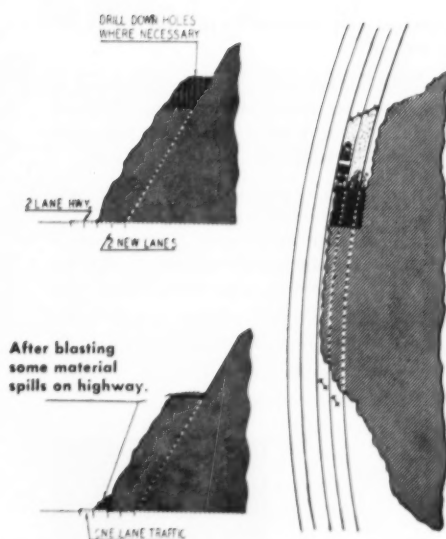
Ask your Ingersoll-Rand AIRengineer for a demonstration now . . . or write direct for more information on this amazing development.

Ingersoll-Rand

Impactool Division
11 Broadway, New York 4, N.Y.



Highway Widening Jobs Need Not Obstruct Traffic



Contractors can take highway widening jobs without building bypass roads to carry traffic.

The busy highway shown above is being widened from two lanes to four lanes using the method described at left.

The problem was solved by keeping the trucks and excavating equipment off the highway so that it remained open for traffic except at intervals when shooting was necessary.

The Eimco 105 Tractor-Excavator was ideally suited to this type of job. It loads large trucks full from the end and cleans up the big boulders quickly. With the Eimco operating in a straight line, forward to dig and load and reverse, with the bucket moving overhead, to discharge.

Digging in dirt and consolidated material can often be accomplished without blasting the material at all. The Eimco 105 will load in dirt at the rate of 10 yards per minute and in rock the rate of loading is 6-7½ yards per minute depending on the material.

Eimcos are heavy-duty machines built to handle the toughest kind of jobs. They can apply more thrust force at the digging lip than larger equipment costing several times as much.

Write for complete information on Eimco 105 Tractors.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A.

Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kalamazoo, Mich. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa



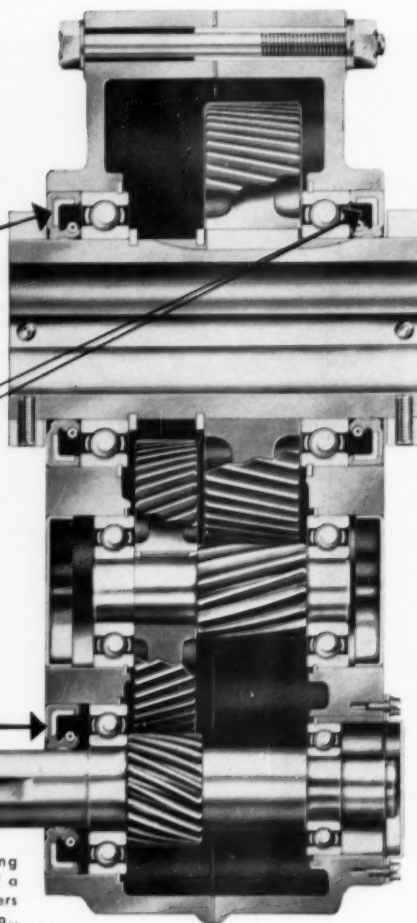
Over half the
speed reducer
manufacturers . . .

KEEP
DIRT OUT ...

KEEP
LUBRICANTS
IN ...

WITH
KLOZURE^{*}
Oil Seals

Cross sectional view showing
Garlock KLOZURES on one of a
complete line of speed reducers
made by Dodge Mfg. Corp.,
Mishawaka, Indiana.



Makers of such fine precision products as The Dodge
Torque-Arm Speed Reducer will not compromise when
specifying oil seals. They know that the reputation of

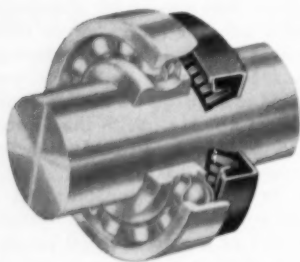
their entire product may depend on the quality of the
oil seals they put in it.

Think about this the next time you have occasion to
specify oil seals, and we think you'll choose Garlock
KLOZURE Oil Seals—guaranteed to do the job you spec-
ify with minimum power loss and heat generation.

KLOZURES are available in a complete range of types and
sizes. Therefore, be sure to call in one of Garlock's 125
trained sales engineers right at the start. His experience
will save you time and money. Or, write today for
Catalog No. 10.

^{*}Registered Trademark

Model 53 finger spring
KLOZURE for normal
and high speed service,
applied to a shaft to
protect the ball bearing.



THE GARLOCK PACKING COMPANY, Palmyra, New York

For Prompt Service, contact one of the 30 sales offices and warehouses throughout the U.S. and Canada.

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Rubber Expansion Joints



Elliott 125-hp, 600-rpm flange-mounted motor driving reciprocating compressor. Note the neat, compact arrangement of this efficient installation.



ELLIOTT

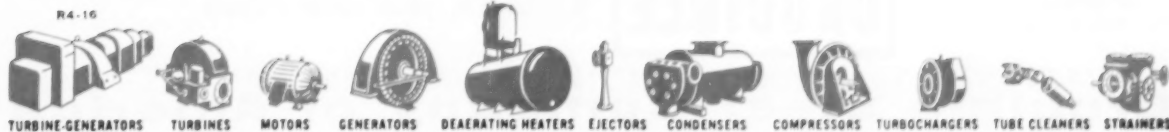
flange-mounted motor

for reciprocating compressors

COMPACTNESS AND ECONOMY of installation makes this motor-driven compressor unit a neat "package" on any floor. The Elliott motor, a vital element in this unit, requires a minimum of space with the motor stator mounted on a flange bracket on the side of the compressor frame and the motor rotor mounted directly on an extension of the compressor shaft. Elliott motors are available for this type of installation as squirrel-cage induction motors and either unity powerfactor or .8 PF leading synchronous motors in ratings of 125 and 150 hp at 600 rpm and 200 and 250 hp at 514 rpm.

Excellent design and careful workmanship make this Elliott motor a worthy teammate for your compressor. Insulation, the key to long motor life, is given very special attention. The finest materials are selected, and they are applied by experienced craftsmen. In addition, Elliott will supply any make of control requested and *provide a completely coordinated motor, control and exciter combination.* For complete technical details, write Elliott Company, Ridgway Division, Ridgway, Pa.

ELLIOTT Company 



how to get the most out of HOLLOW DRILL RODS

The present trend in mining is toward smaller drill holes which require the use of smaller bits and, consequently, smaller hollow drill rod sizes. And that's increased the use of *alloy* steels such as Crucible CA DOUBLE DIAMOND and 4E Hollow Drill Rods.

These new alloy rods have proved themselves on many jobs by lengthening rod life, cutting drilling costs. But they are not unmixed blessings, for they will give a good account of themselves only if they are handled properly. Hammer and tongs blacksmithing isn't enough. Alloy rods demand greater care in forging, upsetting and heat-treating.

Should You Use Carbon or Alloy Rods?

There's no one answer to that question, unless it is *use the rod that best fits the individual job*. Gen-

erally, air-feed jackhammers and other small, light drills benefit from the use of alloy drill rods. For alloy rods have greater resistance to fatigue, higher elastic limits — important where smaller rod sizes are used.

Rod Stiffness . . .

Rigidity or stiffness can only be increased by enlarging the cross section of the rod. If you decrease the cross section you'll get more whipping no matter what type steel you use, or how you heat treat it. Therefore, don't use a $\frac{7}{8}$ " hexagon alloy rod when you've been using a 1 $\frac{1}{4}$ " round carbon rod, unless an increase in flexing and less stiffness is unimportant.

Abrasion Resistance . . .

The higher the hardness the better a drill rod will stand abrasive wear. Alloy rods have the advantage in this respect, for they can be heat-treated to higher hardnesses than can carbon rods.

Notch Effect . . .

Notch effects caused by failure to overlap heats in treating shanks, or those caused by careless handling, chain marks or corrosion pits all cause rod failure. Alloy rods are more resistant to these nicks or notches than carbon steels, but when they do occur failure can be more rapid.

The answer to better drilling is simply this: choose the right drill rod, and then give it reasonable and proper care.

And for the *right* carbon or alloy hollow drill rods — in the sizes, shapes, and grades you need — Crucible is the place to go. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE**

first name in special purpose steels

Crucible Steel Company of America



No clutch to wear, slip or adjust. Operation reversible. Nickel alloy steels provide the toughness, hardness and high strength/weight ratios needed in vital parts of two new Torsion-Bar Torque Control Impactools. One for

heavy bolted steel construction . . . shown here . . . has adjustable torque range up to 550 foot pounds. The other, to 90 foot pounds. Produced by Ingersoll-Rand Co., Air and Electric Tool Division, New York 4, N. Y.

Nickel alloy steels toughen new tool to run nuts, full speed, to preset torque

No pressure regulator, yet this revolutionary new Impactool speeds the run-down of nuts to a desired tightness, and then automatically shuts off. You can use it at full power and speed.

Nickel steel stands gaff

Heart of the tool . . . shown in the drawing . . . is the torsion-bar torque control. This vital mechanism uses nickel alloy steels to withstand impact and stresses from blows hammered at a rate reaching up to 2400 per minute.

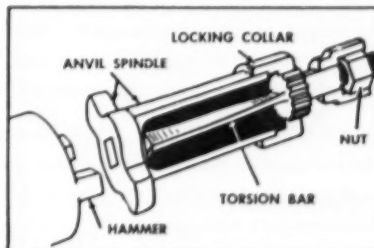
Ingersoll-Rand engineers use nickel steels to obtain hard, wear-resisting, non-spalling surfaces supported by cores with ample toughness to resist shocks and overloads. As in anvil

lugs and locking collar.

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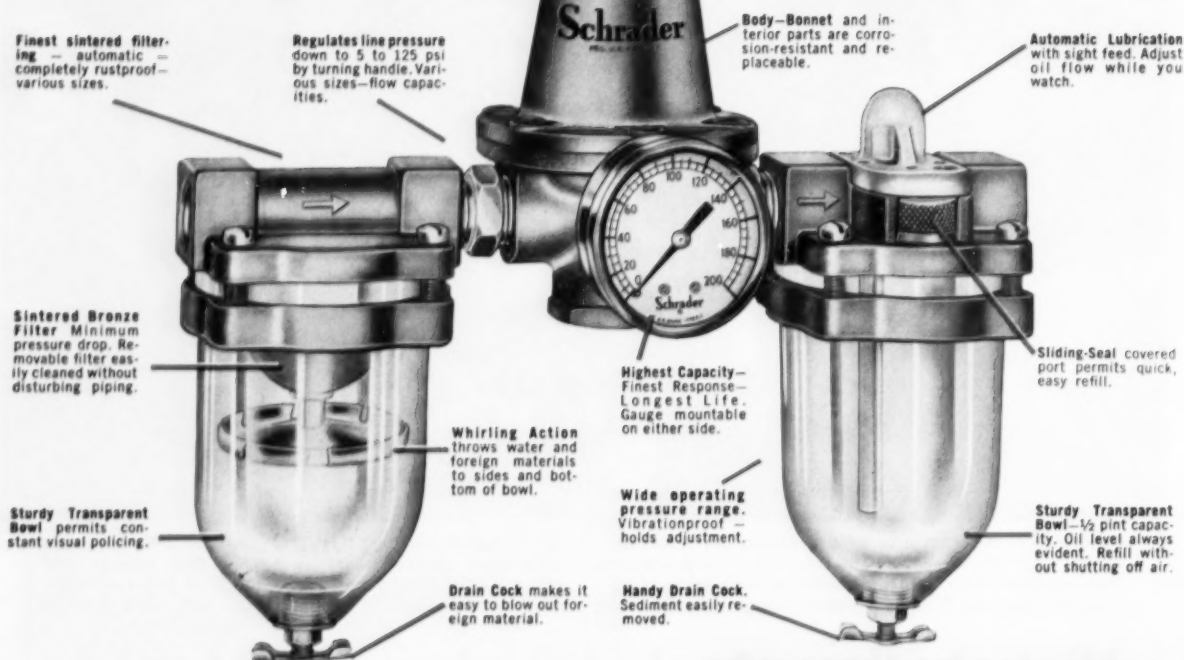


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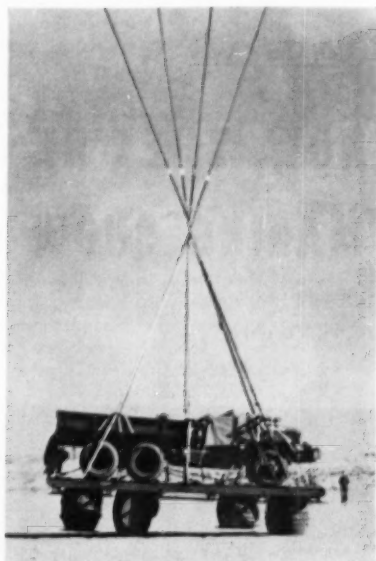


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LEADERS IN AIR CONTROL SINCE 1844

ON THE COVER



BARREL-shaped, air-filled shock absorbers that cushion the impact of heavy loads dropped from airplanes may be of great help in supplying paratroops with equipment. Our cover picture shows six such absorbers underneath a magnesium pallet that is supported during its descent by four parachutes. The illustration above shows a 2½-ton truck just as it is hitting the ground after a similar drop. The cushions are made of a lightweight nylon cord fabric covered with rubber. As the load falls, the cushions fill with air and diaphragms close automatically to keep them inflated. When it strikes the ground, the compressed air in the cushions bears the brunt of the shock and then forces a rubber plug out of each one, causing it to decompress gradually. The absorbers are reusable. During Air Force tests they have reduced the force of the impact of a 1000-pound load from 35,000 to 12,000 pounds.

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CANCER**

*with a checkup
and a check*

**AMERICAN
CANCER SOCIETY**

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 ANNA M. HOFFMANN, *Associate Editor*
 R. J. NEMMERS, *Assistant Editor*
 J. J. KATARBA, *Business Mgr.*
 D. Y. MARSHALL, *Europe*, 243 Upper Thames St., London, E. C. 4.
 F. A. McLEAN, *Canada*, New Birks Building, Montreal, Quebec.

C. H. VIVIAN, *Editor*
 J. W. YOUNG, *Advertising Director*
 FRANCIS HARTMAN, *Circulation Mgr.*
 R. W. SAPORA, *Foreign Circulation Mgr.*

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LOOKING UP THE TOW LANE

Skiers grasp either of two continuous ropes to be pulled up the hill. The ropes, driven by 40-hp motors at the top of the slope, pass over the sheaves shown here at the foot. The poster in the center is a "do-and-don't" illustrated safety lesson for the guidance of the tow riders.

SKIING originated as a means of getting over snow-covered ground and was common among ancient peoples in several lands. In some regions of heavy snowfall they not only wore skis themselves but also fashioned something of the sort for their horses. We are not told how the hapless creatures fared, but feel sure that the equine skis must have been considerably different from the conventional type that man has difficulty in mastering. Skiing for sport is only about a century old, but it has caught on fast and now easily predominates.

The word ski stems from the Icelandic *scidh*, meaning "a piece of wood." The Scandinavian god of winter, *Ulf* or *Ullar*, was always depicted as walking on skis, the curved toes of which gave rise to the legend that they were really ships that wafted him over the land. Ninth century poets of northern Europe even referred to ships as "skis of the sea."

Skiing for sport began at Telemark, in Norway, about 1860, and the name of the town is still applied to a certain downhill maneuver on skis. Within twenty years Americans were trying their hand, or foot, at it, and in 1893 Torjus Hemmestveldt (the name somehow does not sound very American) set a world record for jumping at Red Wing, Minn. As everyone knows, skiing has become so popular that it is now a regular feature of the winter Olympic Games. The fact that our representatives practically never get their names in the winners' column doesn't deter Americans from adopting



MAIN SLOPE

The road in the foreground is practically bare, but beyond the fence is a blanket of machine-made snow from 1 to 3 feet thick. The horizontal lines are laterals for spraying units. The top of the hill is 1000 feet away and some 200 feet higher than the point from which it is viewed.

the sport wholeheartedly. We have no figures on the number of them who participate, but the Ski Association of America, organized in 1904, now has 50,000 members.

Residents of our northern states and of the higher mountain areas can ski most of the winter. Those who live elsewhere have the big problem of finding enough snow. Some years Nature is kind to them, but she has been rather niggardly about it of late. It is a rare winter, indeed, when the thousands of skiing

devotees in New York City and other populous centers along the eastern seaboard can count on sufficient natural snowfall to properly prepare the runs in the nearby mountains such as the Poconos of Pennsylvania and the Catskills of New York. Consequently, they have been going farther afield.

On Thursday and Friday of each week from November to April several of the New York daily newspapers report on snow conditions at skiing sites both near and distant, and on week-ends there is a

Skiers Get a Break

NOW THEY'RE MAKING SNOW

C. H. VIVIAN

big exodus from the city. Those with the time and means may go far up in New York State or New England, or to the Laurentians in Canada. The more affluent occasionally even fly to the Swiss Alps for a winter holiday. Others not so fortunately fixed must pick closer spots. There they are subject to the whims and caprices of heavenly forces, which may or may not send down a white carpet when it is desired.

As is usual when things don't go as man wants them, he lends Nature a hand, thereby refuting Mark Twain's lament that nobody does anything about the weather. He took over the snow-making chore at three skiing centers in

Anybody for Skiing?

GOOD news for small boys with sleds and anybody with a pair of skis—they've found a way to make snow, real snow! The trick requires only compressed air, water, spraying equipment, know-how and, of course, freezing temperature. As yet, the cost comes a little high for backyard family service, but it is well within the economical reach of winter sports centers.

In a state park a little more than an hour's drive from New York City, a mechanical snow-making plant set up by Gilbert Edwards, Inc., provided a good skiing surface every week-end and holiday during the past winter. This article tells how it was done.

New York State during the past winter, and the time may come when most of the places that can't depend on natural snowfall will adopt the "do-it-yourself" plan.

Artificial snow is not new. Prior to World War II, Madison Square Garden in New York City was prepared for winter sports shows by grinding up ice and blowing it on built-up slopes under pressure with the heat in the building turned off. A newer and better way is to spray finely divided water into the air when the temperature is below freezing. This is closely akin to Nature's own method, snow being defined as water vapor in the air that has been crystallized into geometric forms.

One of the snow-making plants was operated last winter in Fahnestock State

Park in New York's Putnam County. Located only 60 miles north of New York, at an elevation of 1100 feet, the ski center there is probably the nearest one to the nation's largest city. As it is directly on Taconic Parkway, a motor-ing boulevard, and also only a few miles from either Cold Spring or Carmel rail-road station, it is easily accessible to Gotham's skiing enthusiasts. They can visit it week-ends and still sleep at home. The skiing facilities there are run on a concession basis by Gilbert Edwards, Inc., of Scarsdale, N.Y. Its president, William Gilbert, reports a successful first season and plans to expand operations next year.

In principle, snow-making at Fahnestock consists essentially of bringing compressed air and water together at a

SYNTHETIC SNOWSTORM

The mist, made by atomizing water with compressed air, crystallizes into millions of snowflakes. Under the most favorable conditions a sprinkler can lay as much as an inch an hour on a circular area 60 to 80 feet across. The material looks, packs and feels just like natural snow.

PHOTO, CARL LINDQUIST



nozzle that acts in the same manner as a paint spray gun. The function of the air is to atomize the water thoroughly and produce droplets so fine that they will freeze or crystallize before falling to the ground. Actually, a layman walking on the snow cannot distinguish it from the natural kind. One who expects to find it composed of particles of ice is surprised. The material is fine-textured and looks, packs and feels like any other snow. Under appropriate atmospheric conditions, larger drops can be formed and will produce a more granular type of snow that skiers call "corn" snow.

The main ski slope is 1000 feet long, 200 feet wide and has a descent of 210 feet. A beginners' slope is 350 feet long, 350 feet wide and drops 60 feet. There are also five trails through the woods. All were supplied with machine-made snow from December to the end of March. Among the equipment installed at Fahnestock were air compressors, a water pump, piping, hose lines and sprinklers. To provide adequate water, a brook was dammed near the foot of the main slope and a small wooden shed erected at the edge of the pond. Inside

was housed a Marlowe gasoline engine-driven centrifugal pump mounted on a pneumatic-tired cart. It delivered 125 gpm against 160 psi pressure. Its suction line extended through the back of the shed and its free, screened end normally rested on the bank of the pond. But whenever snow-making was to begin it was swung around and immersed in the water through a hole cut in the ice.

Stationed near the shed were two Ingersoll-Rand Gyro-Flo portable compressors—a diesel-driven 600 cfm unit and a gasoline-driven 210 cfm machine. On the surface at the outer edge of the 2-rope tow line that ran along one side of the main skiway extended two 3-inch coupled aluminum pipes, one for air and one for water, and at regular intervals in these lines were valved outlets for attaching hoses that carried the water and air to "laterals" on the ski slope.

Each lateral consisted of an air hose, a water hose and an electric line wrapped with tape containing electric heating elements. This binding material, made by Smith & Gates Company, was designed to prevent the water from freezing before it was sprayed. At intervals of ap-



FUEL FOR COMPRESSORS

The two portables, which operated without trouble all winter, got their fuel through lines extending from the two small tanks at the left.

proximately 23 feet was a sprinkler unit, there being seven throughout the lateral's length of about 140 feet. The sprinklers were Turf King midget models manufactured by Buckner Manufacturing Company, of Fresno, Calif., for irrigation service. They are of the familiar revolving type, having two opposed nozzles branching from a central vertical riser. The main nozzle has a $\frac{5}{32}$ -inch opening; the other one is smaller. Each unit discharges 4.9 gpm, and when used for irrigating will cover a circular area 78 feet in diameter.

Incorporated in the base of each sprinkler was a heating cartridge or chamber made by Larchmont Farms Company, of Lexington, Mass., which also assembled the equipment. The heater was essentially a rectangular metal box containing an insulated 75-watt element that received current from the wire in the lateral previously mentioned. Water entered at one side of the box and air at the other side. One purpose of the heater was to prevent the water from freezing

PHOTO, CARL LINDQUIST



THEY FURNISHED THE BLOW... AND OUT CAME SNOW

Together, the two Ingersoll-Rand portable compressors at the foot of the main slope delivered 810 cfm of air at 100 psi pressure. Conveyed to lines of sprinkler units, the air blast divided a stream of water into tiny droplets that became snow before they reached the ground. Up to 40 of the spray units were operated at a time.



before it left the sprinkler, but an even more important one was to warm the compressed air which, upon expanding at the nozzle tips, exerted a refrigeration effect by suddenly dropping in pressure from 100 psi to atmospheric.

Six laterals were in service, making a total of 42 sprinklers. In addition, there were several larger Tey sprinklers mounted about 3 feet above ground level on metal tripods. These units, which operated without heaters, have two air outlets about 3 inches apart, with a water outlet midway between them. Each uses about 100 cfm of air and throws a spray fully 100 feet, as compared with an air consumption of 20 cfm and a spraying height of 30 to 40 feet for the revolving type.

Hoses, laterals and Tey sprinklers were moved about on the slopes as required to cover the various areas with snow. Two-inch air and water lines extended to the beginners' ski run, which is below and at one side of the main slope. The paths in the surrounding woods could be reached by lengthening the hose lines. All sprinkling equipment except the aluminum piping was, of course, removed on skiing days.

Snow was made at night to take advantage of the lower temperatures then available. In general, the prevailing winter readings at Fahnestock are about 10° below those in New York City. As the slopes were open only on week-ends and holidays, it would have been practicable, given favorable atmospheric conditions, to provide enough snow by operating, say, on Thursday and Friday nights only. However, sometimes the temperature did not drop to the snow-making level, and as one could not foretell with certainty just when everything would be right, the policy was to make snow every night that it was possible to do so. This plan worked out so well that at no time during the season were the slopes without snow.

In the beginning, attention was paid only to the temperature. If it dropped a few degrees below freezing, the snow-makers got busy. Later on it was discovered that humidity also had to be considered, and a hydrometer was purchased and watched closely. It was found that when the humidity was relatively low, snow could be produced even though the temperature was but slightly below freezing. However, with the mercury at 29 degrees, for example, and the humidity up around 80 to 90 percent, the crews learned that it was useless to try to get good results.

Besides above-freezing temperatures, wind is a bugaboo of the snow-makers. As the nozzles spray the mist high in the air, a stiff breeze will carry the snow off into the woods as fast as it is formed, with little of it falling where it is wanted.

For some reason not yet fully explained, the performances of the two



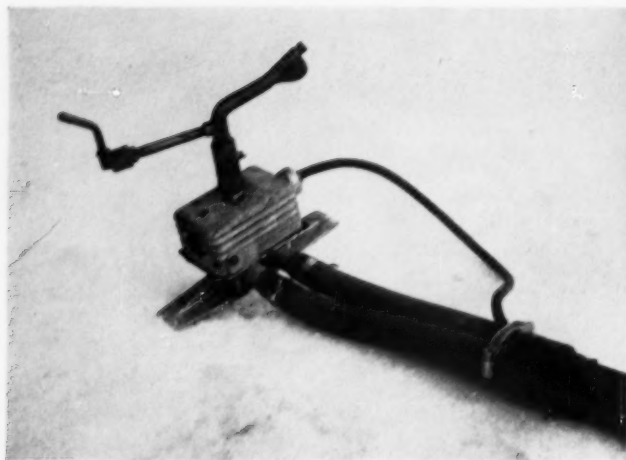
LOOKING UP AND DOWNHILL

Twin 3-inch aluminum pipe lines ran 1000 feet up the slope parallel with the rope tow lane (upper view). At the lower-left is one of the valved take-offs for hoses extending to the spraying units. Note the wind-blown snow on the tree at the left edge. Looking down the tow lane in the other picture we see the air compressors, a workshop that also housed the water pump and, beyond it, the pond that supplied the water for making snow.

types of nozzles seemed to vary with atmospheric conditions. In temperatures well below the freezing point, and with all other factors favorable to the formation of snow, the Tey units made a better relative showing than when the tem-

perature was only a little below freezing and conditions could be classed as marginal. At such times the smaller revolving sprinklers incorporated in the laterals apparently worked better.

Skiers like a substantial base of packed



snow topped with a few inches of soft or powder snow. Nature doesn't always meet these specifications, but her new mechanical substitute can do that. A 1-to-3-foot thickness of snow was maintained throughout the winter, and a fresh mantle could always be applied at some time between week-ends. Under the most favorable conditions, up to an inch an hour could be produced.

Various persons have had a hand in bringing snow-making to a commercial status and it is difficult to trace all stages of the development. Philip Tropeano, chief engineer of Larchmont Farms Company, is responsible for much of it, but disclaims any credit, saying that he discovered the process purely by accident. The principal business of his firm is the designing and building of equipment and machinery for the agricultural industry, and Tropeano first applied heating elements to Buckner sprinklers in an effort to develop a means of creating a warm fog for the protection of citrus-fruit groves on frosty nights.

He intended to operate the equipment with steam, and one cold night, when he was endeavoring to determine the volume and velocity that would be required, the supply of steam was cut off. He connected the unit up with the plant's compressed-air line, but was called away right afterwards and didn't return for about an hour. He was surprised to find the ground covered with snow and more of it being sprayed. Thus the company got into a new branch of business, and as his brother Joseph, sales manager of the concern puts it, "The story was amazing from then on. One thing has led to another, and we have installed the equipment at skiing areas in various parts of the country, including one in California and two near Chicago."

The story of the Tey nozzle is also a bit unorthodox. It was developed by Wayne Pierce, an engineer who made snow in the backyard of his home at Milford, Conn., just for the fun of it.

Then he found out he could sell the apparatus, and there is now a Tey nozzle factory in Connecticut.

William Gilbert, head of Gilbert Edwards, Inc., was so well satisfied with the first skiing season that plans are already underway to provide larger equipment for next winter. It is expected that 1200 cfm of compressed air instead of 810 and 300 gpm of water instead of 125 will be made available.

Clarence Fahnestock Memorial State Park, to give it its full name, is a 3400-acre playground which is pretty much in its natural state except for a few artificial lakes. Among the latter is one of 60 acres stocked with trout, another of 130 acres for bass fishing and a smaller one for pickerel. Boats can be rented, and



LATERAL ON MAIN SLOPE

Air and water hoses and an electric line were wrapped together with a tape embodying heating elements. Sprinkler units in these laterals were spaced 23 feet apart. A sprinkler and a short section of lateral are shown in detail at the top. An electric line is plugged into the box on which the sprinkler is mounted.

in winter the lakes are open to skaters.

The Appalachian Trail runs through the park and there are hiking and bridle trails. There are no inns, restaurants or other commercial establishments, but snacks can be obtained in a lodge near the ski slopes on days when they are open. There are camping and picnicking areas, and on a Sunday last February 60 cars were counted in the picnic zone by Park Superintendent J.W. Cowan. In the wintertime, however, skiing is by all odds the big attraction, and 750 or more enthusiasts were on hand on some of the nicer days during recent months. Machine-made snow seems to be very much to their liking, and lots more of it will very likely be produced there and at other locations in the years to come.

Something About Spectacles

Once a mark of social standing,
"glasses" now help millions
perform their daily work

JANE S. MULLER

MANY people are of the opinion that "glasses" or spectacles are of modern development. The fact is that the origin of these visual aids extends far back into antiquity. Glass manufacture, as such, is one of mankind's oldest occupations, but when the first eyeglasses came into being can only be surmised. It is known, however, that even before primitive man learned how to make glass he devised goggles with narrow slits to admit a minimum of light and thus to protect his eyes. History also records that a Chinese emperor who lived more than 2000 years B. C. supposedly observed the stars through lenses fashioned of rock crystal, quartz, topaz and amethyst.

The earliest glass lenses of which we have knowledge were round and held by hand close to the object to be viewed. Later, the Chinese used large oval lenses to distinguish the fine characters of their picturesque calligraphy. That was in the thirteenth century when Roger Bacon invented convex lenses. And for information on spectacles we turn to Giordano da Rivalto, an Italian priest, who said in a sermon preached in the beginning of 1305 that "it was only twenty years since the art of making spectacles was discovered." This statement seems to be borne out by an inscription on a tombstone in a Florentine church which reads, "Here lies Salvino del Armati, the

inventor (1285) of spectacles." A fresco dated 1360 in the Church of San Nicola in Treviso shows Cardinal Ugone wearing two lenses with handles riveted together, thus giving further evidence that eyeglasses were in use at that time.

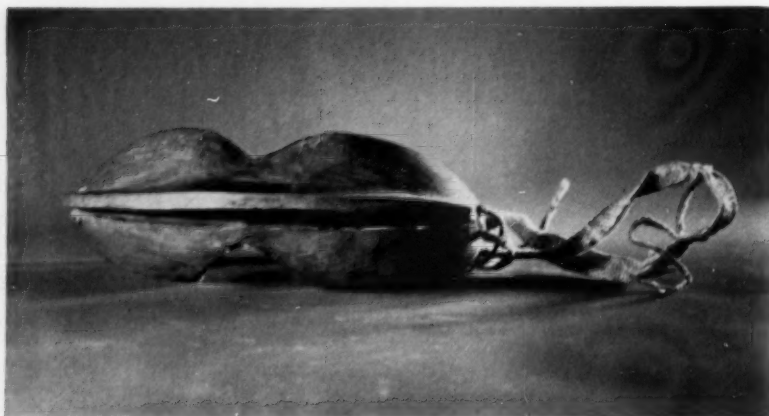
But few men other than those of holy orders probably wore spectacles before the invention of printing in the fifteenth century. Soon after, however, they were

in demand in Italy and Germany, and as early as 1465 a guild of spectacle makers existed in France. When those associations were liquidated in that country peddlers included eyeglasses among their wares, thereby not only keeping alive the market for them but actually promoting the business. By 1600 opticians were to be found in every sizable town on the Continent of Europe, and a spectacle makers'

FOUR CENTURIES OF PROGRESS

A sixteenth century German painter, Anna Dorothea Therbusch-Lisiewska, wore a monocle suspended from a band passing around her head. Modern spectacles, in addition to correcting defective vision, are designed to harmonize with the wearer's facial characteristics.





GLASSLESS "SUNGLASSES"

Before primitive man made glass, he used goggles with horizontal slits to protect his eyes from strong light. The example shown here is from a collection in The University Museum, Philadelphia, Pa. Such shields, carved out of driftwood, have reportedly been worn by Eskimo hunters for 2000 years to ward off snowblindness.

guild had been organized in England.

History tells us that the first bifocals were made in America in 1760 as a result of Benjamin Franklin's impatience with the necessity of changing from "reading" to "distance" glasses. In the earliest spectacles of this type the lower part of the lens was cut away and an identically shaped piece was fitted into the opening, the line of juncture being clearly visible. Distant vision was corrected by the upper or less powerful segment and near vision by the lower section of greater refractive value.

Another method of making bifocals was to give a single lens two different curvatures by grinding with a rotating hollow brass tube and emery and polishing with an ebonite tube and rouge. In the case of a third type, still available, a hollow is first ground and polished in a crown-glass lens; then flint glass with a higher refractive index is brought to the same curvature and laid in the hollow, taking care all the while to prevent the infiltration of dust and air between the lenses. Next, the two are fused electrically and the entire surface is ground to the same curvature, thus obtaining an almost completely invisible joint. The latest advance is the multivision or trifocal lens with an intermediate-power segment between the near- and distant-vision sections. It may be in any one of several shapes such as a bar or crescent, depending on the work for which it is intended.

Several major refractive defects in the eye are either eased or corrected by wearing eyeglasses. One is malconformation of the cornea or lens which may appear as an improper curvature or as a variation in the refractive power of the eye in different meridians. The latter is known as astigmatism and was recognized by Thomas Young, an Englishman, in his own eyes. As his case was a mild one he

found he could compensate for the variation by looking through his spectacles at an oblique angle. Sir George B. Airy, who had one eye so astigmatic that it was nearly sightless, demonstrated that a spherocylindrical lens would correct the condition and had an Ipswich optician make him one in 1827.

Seldom prescribed or applied until the end of the nineteenth century, cylindrical or toric lenses are now generally ordered for astigmatic eyes to give added strength to the weakened meridian or to reduce the power of an overly strong one. A third reason for wearing glasses is presbyopia—in simple language, far-sightedness, which is associated with advanced age. It is caused by loss of elasticity of the crystalline lens so that near objects cannot be seen distinctly without convex glasses. Spectacles also offset lack of proper muscular coordination of the eyes.

Though their primary function is to correct defective vision, eyeglasses—or, better, goggles—also play a vital part in preventing eye injury industrially and otherwise. They are widely used by glassblowers, welders and metal founders, for example, and by people living in areas where they are exposed to an excess of ultraviolet rays.

According to the dictionary, one who makes and/or deals in optical glasses is an optician. He prepares spectacles according to prescriptions written by ophthalmologists who scientifically examine patients' eyes to provide them with the spectacles they need to correct defects without the use of drugs. Easton Optical Company, which has been oper-



BAUSCH & LOMB PRINT

SEVENTEENTH-CENTURY SPECTACLE SALESMAN

His shop was decorated with all kinds of optical goods. Here a prospective customer has stepped out into the light of day to try a pair of reading glasses. Even then, glasses were carried in boxlike cases similar to ours.

ated for nearly four decades in Easton, Pa., by the Boquist brothers, fills such orders for many of the community's optometrists. Although small, the shop is compactly arranged with a sample and fitting room in the front and a workshop in the rear. Of the lens blanks kept in stock, some are polished on both sides for finishing and others are rough on one side. Flint, crown and plastic lenses are most commonly used today, the first-named having the highest refraction index because of its greater lead content.

When a prescription is brought into the shop, lens blanks are marked for center and axis so they can be accurately blocked for processing. If the prescription calls for a prism that, too, must be indicated. They are then cemented with pitch or resin to a curved iron body or block in much the same manner as described by Baptista Porta of Naples, Italy, in his famous *Magia Naturalis* (Natural Magic) published in Frankfurt, Germany, in 1591. To quote from the English translation of 1658: "In Germany there are made (hollow) Glass-balls, whose diameter is a foot long, or thereabouts. The ball is marked with the Emrilstone round and is so cut into many small circles, and they are brought to Venice. Here with a handle of wood are they glewed on, by Colophonia melted. And if you will make Convex Spectacles, you must have a hollow iron dish, that is a portion of a great sphere. . . and the dish must be perfectly polished. . . upon the Dish or Ball, there is strewed white-sand. . . and with water it is forcibly rubbed between our hands, and that so long



BAUSCH & LOMB PRINT

FRANKLIN AND BACON

Roger Bacon, English monk-philosopher, discussed the science of optics in general and lenses in particular in his "Opus Magnus" (1268). He invented convex lenses to compensate for farsightedness. Benjamin Franklin developed bifocals in 1760.

until the superficies of that circle shall receive the Form of a Dish, namely a Convex superficies. . . then rubbing it over again with powder of Tripolis that it may be exactly polished; when it is perfectly polished, you shall make it perspicuous thus. They fasten a woollen-cloth upon wood; and upon this they sprinkle water of Depart and powder of Tripolis; and by rubbing it diligently,

you shall see it take a perfect glass."

For the blocking operation both the curved iron bodies and lens blanks may be heated so that the latter will adhere quickly to the pitch, being sure that the center and axis marks on both lenses and blocks are in alignment. After cooling, the lenses are ground. It used to be quite a job to clean the blocks, but that work can now be done with ease by the aid of compressed air. The blocks are placed in a basket and immersed in a tank containing a petroleum solvent that dissolves the pitch while the air, forced through the perforations in a coil beneath the basket, agitates the solution to remove the adhesive material from all surfaces.

Most of the precision machines in Easton Optical Company's shop are made by Shuron Optical Company, Inc., of Geneva, N. Y., and one of the most remarkable of these is the toric lens generator that turns out both spherical and cylindrical lenses. It has a cup-shaped diamond-impregnated grinding wheel that revolves at the rate of 5000 surface feet per minute. It is the position of the axis of the wheel in relation to the workhead pivot point that determines the curve. When the axis passes through the pivot point a sphere curve is obtained; when the wheel is offset, a toric lens is produced. The lens blank is held in a chuck that must be set with extreme accuracy, and any curve, minus or plus, within the range of the grinding machine can be generated after making three simple dial settings.

The act of generating, as expressed in the optician's language, is merely passing the lens across the face of the dia-



PIONEER OPTICAL SHOP

Artist's conception of Christmastime in front of the small optical shop that was opened by John I. Bausch in Rochester, N.Y., in 1853. That was the beginning of the Bausch & Lomb Optical Company. In 1886, Bausch devised the first American power-driven lens-grinding machine, and the firm entered the lens-making field before the end of the nineteenth century. Bausch & Lomb also was the first commercial producer of optical glass in the country and replaced foreign sources of supply during World War I.

mond wheel until the desired amount of glass has been removed. In the case of many prescriptions a single cut will suffice. However, it is preferable to take more than one, each larger than 1.0 millimeter if possible except for the last 0.2-millimeter or clean-up pass, to insure a high-quality surface within a tolerance of 0.001 inch. Output per generator ranges from 160 to 220 lenses and more in an 8-hour day.

The lenses are now ready for finishing with fine emery, rouge or other polishing compounds. For this work Shuron has designed surfacing machines that simulate the movements followed in grinding toric and spherical lenses. The sphere-lens surfacer performs both fining and

polishing simultaneously, but other than that the machines function automatically and the operator is able to adjust the abrasive feed and the pressure on each lens for every variation in curve and thickness of lap or pad beneath the glass. But before the lenses can be fitted into frames they must undergo further processing. Tiny rivet holes are drilled in them and edges are beveled or otherwise finished—work that is now done by precision machines.

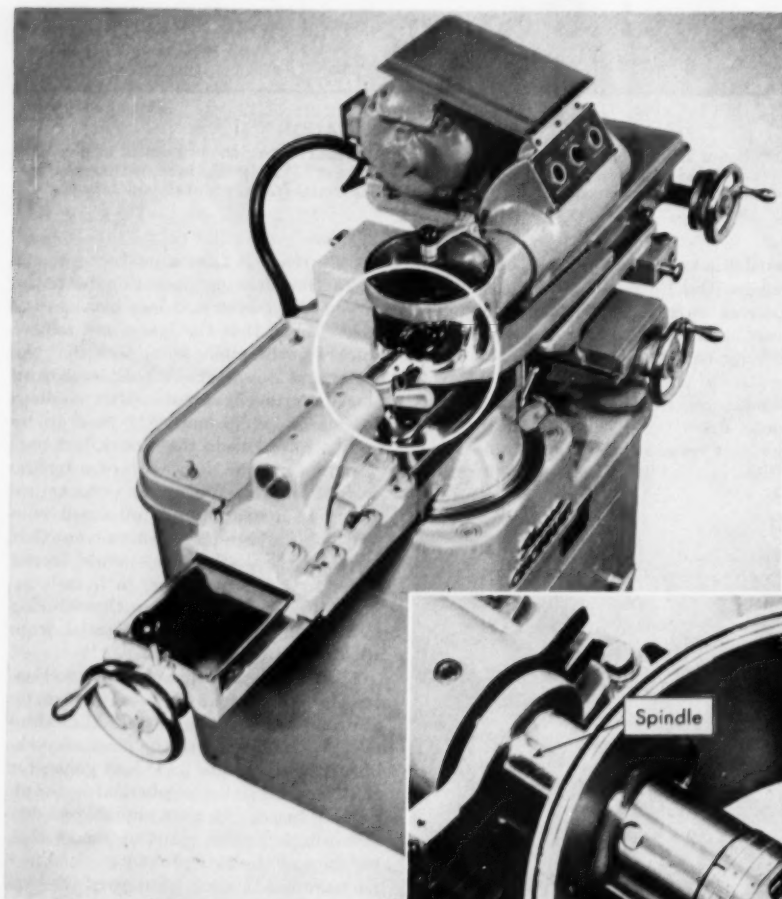
Because glass breaks more easily than plastic the latter material offers more eye protection and lenses of that type have found wide industrial application. Some are molded of soft materials, others, like those made of resin by Armorlite

Lens Company, are cast between dies under rising temperature and pressure until they are set hard. They are now available in crystal-white and in green or flesh tints in both single-vision and bifocal powers, including spheres, cylinders and prisms. They are said to be highly resistant to scratches, welding spatter and all common chemicals, and are less prone to fogging than glasses during abrupt temperature changes. Such lenses, however, are weakened by drill holes and should be mounted in grip-type frames.

Over the years eyeglass frames have undergone radical changes. Back in the thirteenth century the Chinese held tortoise-shell mountings in high esteem because the turtle was to them a sacred reptile and tortoise-shell frames were considered symbols of good fortune and long life. But horn and, later, metal were commonly used, and in 1862 John Jacob Bausch, one of the founders of Bausch & Lomb Optical Company, conceived the idea of molding rubber frames. Now plastic is the favored material.

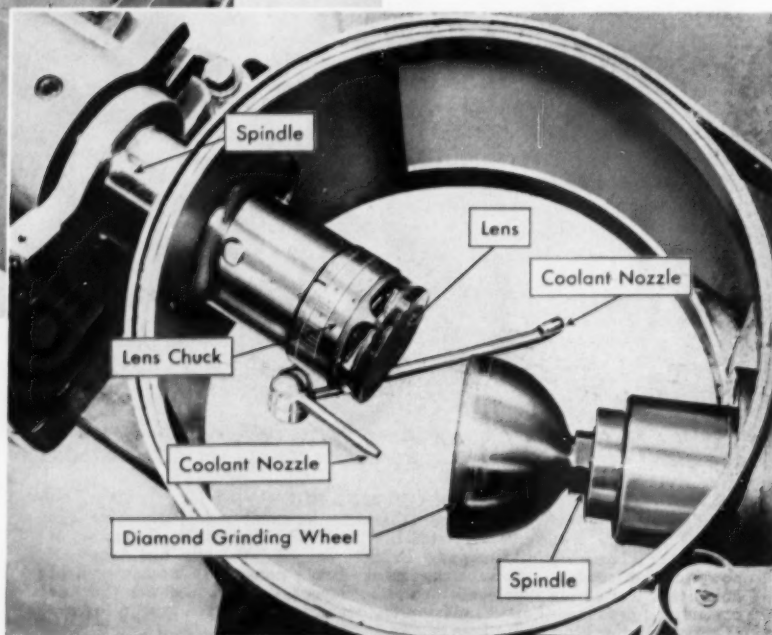
Today, one of the exasperating problems confronting firms such as Easton Optical is the many styles of frames produced without regard to fit by plastics manufacturers with whom they are just one of many items. Made as they should be by optical concerns they incorporate features such as earpieces that can be shortened or lengthened and nosepieces that can be tightened or loosened—features, in short, that can be adjusted to an individual's facial structure. Of course, frames do not enter into the picture where contact lenses are concerned.

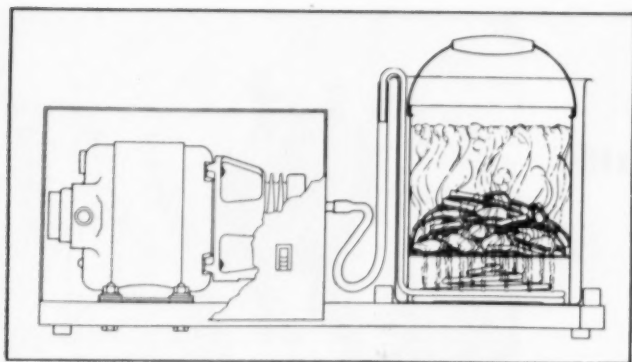
Contact lenses which move with the eyes and become a part of the refractive



TORIC LENS GENERATOR

Generating is the term used to denote passing a lens across the face of a diamond wheel until the desired amount of glass has been removed. The machine shown above, made by the Shuron Optical Company, Inc., of Geneva, N.Y., will generate any curved surface after three dial settings are made. It grinds lenses as prescribed by ophthalmologists to an accuracy within one-tenth of a millimeter. Grinding is done in a totally enclosed chamber that is circled in the picture above and seen in detail in the view at the right.





system are one of ophthalmology's most significant advances in recent years. They are invaluable to singers and theatrical folk because they give them correct vision without being visible. As to their origin, we do know that Sir John Herschel, a British astronomer, wrote an article early in the nineteenth century in which he suggested making corneal contact lenses. On the subject of correcting regular corneal astigmatism, he stated:

"The strict method, applicable in all such cases, would be to adapt a lens to the eye of nearly the same refractive power, and having its surface next to the eye an exact *intaglio* facsimile of the irregular cornea, while the external should be exactly spherical of the same general convexity as the cornea itself." In a footnote Sir John commented: "Should any very bad cases of irregular cornea be found, it is worthy of consideration, whether at least a temporary distinct vision could not be procured by applying in contact with the surface of the eye some transparent animal jelly contained in a spherical capsule of glass; or whether an actual mould of the cornea might not be taken and impressed on some transparent medium."

Contact lenses of the late 1930's and early 1940's were, as a rule, comparatively heavy flange-rimmed glasses which had to be filled with a solution and pushed under the lids. Because they caused reddening of the eyes, misty vision and an itchy sensation, they could be worn for only a few hours at a time. But these disadvantages have been overcome to some extent with improved grinding techniques which make it possible to produce lenses not more than 1/50 inch thick in some areas. They are cut to exact specifications obtained by making a cast of each eye and according to prescription.

In 1953 the Army Medical Research Laboratory carried out studies to determine the comparative value of framed spectacles and contact lenses. Four types of each were tried out in the laboratory and under routine field and battle conditions in temperatures from minus 40 to 120°F and at simulated altitudes up to 20,000 feet. Spectacles were found to



BLOCKING FIXTURE AND BLOCK CLEANING

To hold a lens securely during the grinding operation, it is cemented with pitch to a curved iron body or block, which is then mounted on a blocking head. Prior to this operation (see picture above), blocks (left) and lenses (right) are warmed on hot plates in the Shuron blocking device. The pitch is heated in the elevated container in the center. Cleaning of the blocks, once a laborious job, is now accomplished easily with the equipment sketched at the upper left. The blocks are placed in a basket that is lowered into a tank containing a solvent. To assist in removing the pitch, the liquid is continually agitated with compressed air, which is introduced through a coil in the bottom of the container.

be best adapted for ordinary use, but for field operations and for those engaged in strenuous activities contacts were considered to be superior because they cannot be knocked off, can be worn while swimming, eliminate frosting and steaming and make it easier to don and doff headgear, gas masks and the like. But perhaps the most important fact brought out was that they increase visual sharpness in cases such as irregular astigmatism. On the opposite side of the ledger are several disadvantages of which two actually involve the eyes themselves: glass contact lenses are easily lost and broken, expensive to replace, wearing time is limited, some involve the use of an accessory fluid and the eyes are readily irritated by smoke, dust and gases.

Perhaps the answer to some of these problems lies in the Tuohy corneal lens which is a curved piece of clear optical plastic minus the flange and about one-fourth the size of the glass contact lens. It averages 11.5 millimeters in diameter, 3/10 of a millimeter in thickness and 1/20 of a gram in weight and floats on the eyeball, natural tears serving to protect the cornea and holding the lens in place by capillary attraction. It has been tested by combat troops under cold-weather conditions to determine its suit-

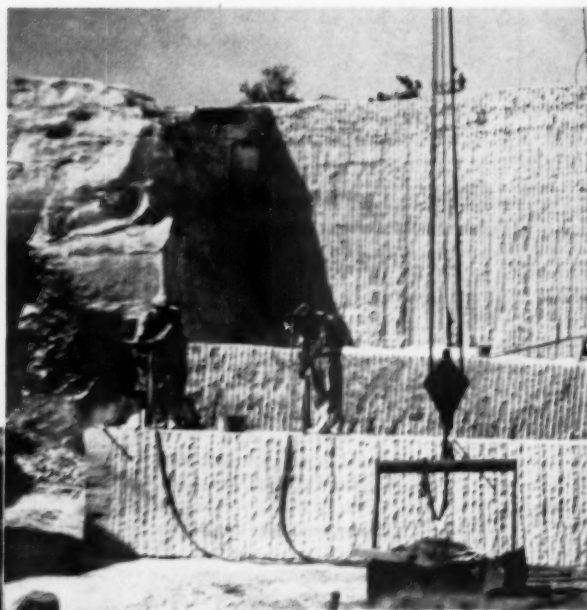
ability as a replacement for spectacles and goggles.

In 1946 Kevin Tuohy, then president of Solex Laboratories in Los Angeles, Calif., was seeking a new type of fluid for use with contact lenses when he stumbled upon the principle of the corneal lens. He had inadvertently sheared the flange from a glass with which he was experimenting and, after some rumination, placed the apparently spoiled lens against his eye and found that it remained there.

According to the inventor, corneal lenses require two critical measurements—that of the inside curve to insure physical fit to accommodate the cornea and that of the outside curve to insure optical fit and to give the eye its needed visual power. An optometrist, ordering a set of such lenses for a person, usually requests three—one exactly according to specifications, one slightly tighter (perhaps a fraction of a millimeter) and one just that much looser—because of the extremely critical tolerances. Once the patient has mastered the art of properly putting on and taking off the tiny pieces of plastic, wearing time without discomfort is almost unlimited. Today, more than 30,000 Americans are using corneal lenses to correct their vision.

The Ordinary Man Calls It Marble

CAREY HOLBROOK



TRAVERTINE IN BUILDINGS

The foyer of the Mountain States Telephone and Telegraph Building in Denver (above) has walls faced with Colorado travertine. An exterior use is shown at the right. The Italian variety of the stone is well known to architects along the eastern seaboard. Because it resists wear well, travertine is often used for stairways and also for the floors of office-building entrances.

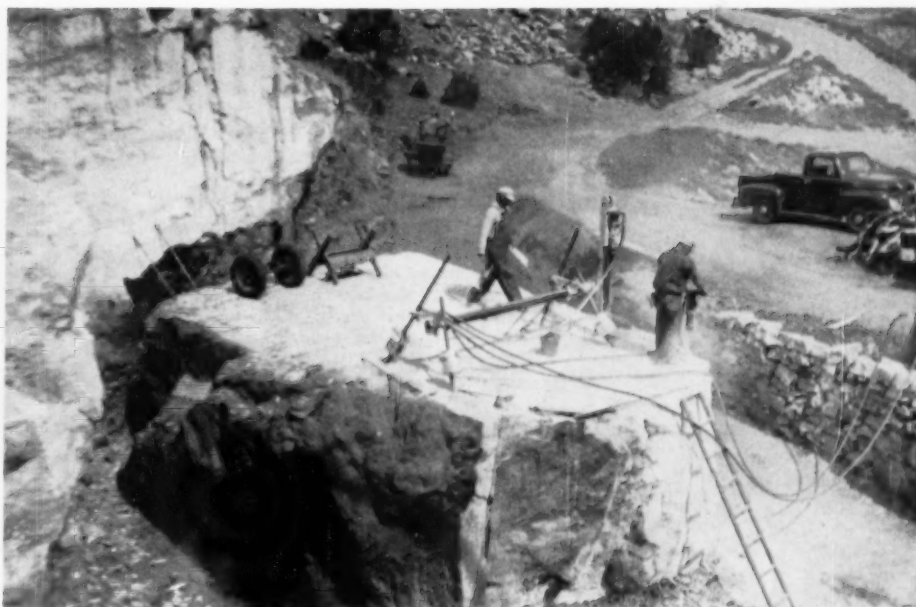
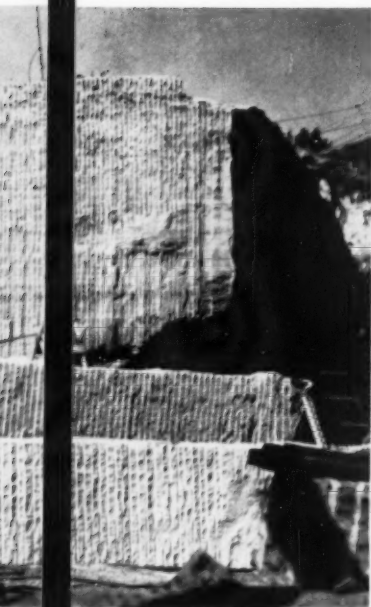
WAY back yonder, before Nero decided to furnish violin music for a fire, the ancient Romans knew the value of travertine as a building material. They got it from the most famous travertine deposits in the world, those at Tivoli, Italy, about 16 miles east of Rome. In fact the name "travertine" stems from this celebrated quarry. In the early days Tivoli was called Tibur, and the word *travertino* (Italian for travertine) is a corruption of *tiburtino*—the stone of Tibur. It was used in constructing many of their fine buildings, among them the Colosseum in the Eternal City. That huge structure, much of which is still standing, was begun in the reign of

Vespasian (70-79 A. D.) and inaugurated by Titus in the year 80.

To the ordinary man, travertine is known as marble which, it is believed, was deposited in eons past by hot springs carrying lime in solution. The ancient Romans had a very good reason for using this material for both the interior and exterior of buildings. It is noted for its warmth of color which ranges from straw to buff, for its beauty when polished, for its strength combined with lightness and for its resistance to abrasion and weathering, its composition being such that it retains the outline of sharp corners and carvings. The stone is especially well suited for the construc-

tion of vaulted structures such as arches. In large rooms it improves the acoustics; as flooring it is less tiring on the feet because of its resilience; and the presence of cavities makes such floors less slippery and also prevents cracking caused by freezing.

Italy is not the only country where travertine is quarried. It is found in Mexico and Argentina, and in the United



PRECISION QUARRYING

To avoid waste, holes are drilled close together in line and huge blocks of stone are broken free from the deposit and then reduced to smaller ones by the same procedure. The blocks in the foreground at the upper-left came from the face behind them and were originally in one piece con-

taining enough stone to make five carloads for use in the New England Telephone and Telegraph Building in Boston, Mass. The workmen at the upper-right are beginning the attack on a large block. Deep line holes are started with a drill mounted on a bar and finished with hand-held jackhammers.

States deposits are located in California, Montana, Florida, Georgia, Minnesota and Colorado. The first stone of this kind to be produced in the latter state came from Wellsville, about 6 miles east of Salida in Fremont County where the Colorado Travertine Company opened up quarries in 1921. This deposit is probably the biggest one in Colorado. It lies near the Arkansas River on high

ground about 1300 feet long and 200 feet thick and contains an estimated 50 million cubic feet of recoverable travertine. The workings were afterwards taken over by Frank Norberg & Company and supplied material for the Denver National Bank, the Mountain States Telephone and Telegraph and the Weicker buildings and the Albany Hotel, all in Denver.

Since then many other structures us-

ing Colorado Colorosa have risen in that city and elsewhere. For example, in the Shamrock Hotel in Houston, Tex., the lobby is of onyx marble, as travertine is also known, and in the Department of Commerce Building, Washington, D. C., the main stairway; in the Naval Stores Building, Philadelphia, Pa., it serves as a finishing material; in the Stockton, Calif., post office as wainscoting; and the Sunnyside Mausoleum at Long Beach, Calif., has exterior walls of travertine.

Two quarries are now in operation near Canon City—Colonna & Company and Cowan Brothers. The latter firm is made up of Joe and Dave Cowan, native-born Coloradans. Producing travertine is no job for a man with only a pick and shovel. Heavy equipment is needed and a large amount of know-how to break blocks from the face and get them ready for shipment. The Cowan Brothers have probably as good a layout as anybody in the state. They have been in business for fourteen years, and during that time have quarried pieces of unbelievably large dimensions. Their record block was 44 feet long, about 10½ feet wide and 16 feet in thickness. Since travertine weighs around 135 pounds per cubic foot it came to approximately 498 tons.

No explosives are used in quarrying the material other than in removing the overburden of shale or dirt, where necessary. The blocks are broken from the working face by means of plugs and feathers, which are inserted in closely



DRILLING ON THE BIAS

This huge block, which fell in the position shown when pried from the quarry face, is being reduced in size by line drilling with a bar-mounted machine.



ACCURATE DRILLING

The row of steels inserted in a line of holes shows how straight the latter are. The holes are spaced $3\frac{1}{2}$ inches apart.

spaced holes drilled by Jackhamers. A plug and feather assembly is simply a wedge and two pieces of half-round steel. The latter are wired together at the bottom to hold the plug, point down. When placed in a hole and struck by a sledge, the wire breaks, the wedge starts spreading the feathers apart, and with each successive blow pressure builds up until something gives. When it does, the block breaks from the parent mass along the line of holes. In the case of one weighing 500 tons it would be necessary to drill at least 150 holes on $3\frac{1}{2}$ -inch centers and 16 feet deep, or a total of 2400 feet of hole. Of course, this mammoth boulder has to be cut into smaller pieces that can be handled. This work is also done with plugs and feathers in the manner just described.

Travertine is shipped from the Cowan quarry in rough blocks weighing from 10 to 20 tons each and finished by the Carthage Marble Company of Carthage, Mo. Placed on Lowboy truck trailers, they are hauled to a railroad siding where they are loaded into cars by a guy-line derrick capable of picking up 25 tons. Two similar derricks and a shovel crane with a lifting capacity of 15 tons are at the quarry.

The Cowan Brothers have other large travertine holdings in Fremont County. One deposit that has just been opened up provides a type called Royal Breche that distinguishes it from Colorosa. It is composed of small varicolored boulders ce-

mented together by Nature in a solid mass and is estimated to have gone through three heats at different geologic periods to reach its present state. When finished it is a very showy product.

The operators of the travertine quarries are a good deal like packing-house people who use everything except the squeal. Because of its high calcium content travertine is a source of limestone for calcining, for use in mortar, and as a lubricant in wire drawing. It also serves as a flux in the reduction of iron and lead ores and supplies lime for beet-sugar processing. The waste pieces likewise have commercial value. Colonna & Company at Canon City has a mill for crushing them and screening chips of different colors into $\frac{1}{4}$ -, $\frac{3}{8}$ - and $\frac{1}{2}$ -inch sizes for the manufacture of roofing and terrazzo flooring. Rock of other colors may be added to give a widely variegated effect that can be further enhanced in the case of flooring by setting the chips in a base of colored cement.

Terrazzo floors have been installed by Colonna & Company in numerous fine buildings in many parts of the United States. They are a permanent part of the structure—will last its lifetime. It takes expert workmen to lay and then finish them by polishing with specially built machines. As travertine was originally quarried in Italy, many Italian names bob up on the payrolls of American companies that are engaged in its production and in laying terrazzo floors.

Cowan Brothers attribute their success in quarrying large blocks of travertine to what they call "precision drilling." It is done with Jackhamers, and without the aid of quarry bars to hold the machines in line except in the case of unusually deep holes when the bar is



JOE COWAN AND ODDITY

One of the owners of the quarry holding a slab of freak travertine called Royal Breche that has been cut and polished. In some manner Nature cemented the small pieces together.

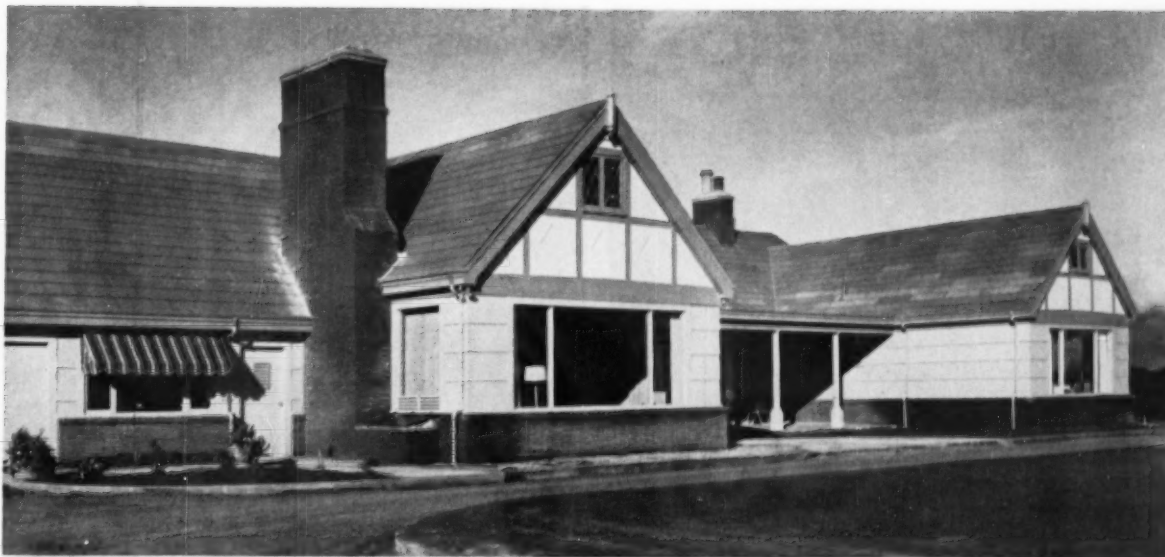
used for the first 4 feet of hole. That the men are able to put down holes as much as 16 to 18 feet deep and still keep them true even though they are only $3\frac{1}{2}$ inches apart means that the drill operators have had years of experience in work of this kind.

During their entire life in the quarrying business the Cowans have utilized Ingersoll-Rand Jackhamers exclusively. Their first machines were model R-39's. From these they graduated to the Type S-49 and, later, to the J-50, a modern, heavy-duty drill that is in service today.



READY FOR SHIPMENT

Blocks of travertine ready for loading at the Cowan quarry. They will be cut to final dimensions by specialists who maintain yards for that purpose.



Wood-waste Cinderella

HARDBOARD

JEAN MATER

THE HOUSE THAT WOOD WASTE BUILT

Ralph Chapman's home in Corvallis, Ore. Excepting the brick chimney and basework, the entire exterior is built of hardboard, even the shingles and the molded columns of the patio. Hardboard is used inside for walls, ceilings, doors and some other parts.

IN OREGON'S Willamette Valley stands a showplace of a house known at home and abroad as the house that wood waste built. Perched on a rolling hill overlooking the city of Corvallis, it is constructed almost entirely of hardboard, a material patented by Ralph Chapman and made from mill trim, edging and rough slabs formerly considered useless.

A scant few years ago the waste wood, which now lives on in this handsome dwelling, would have met an untimely demise in the refuse burner of a sawmill. Today, hardboard is a household byword, a popular material for finishing a basement or a spare room in the attic. No wonder hardboard is considered the Cinderella of the wood-waste world!

Wood "waste," in the lumberman's jargon, is that part of a log that does not end up as merchantable board. About two-thirds of every tree is discarded: one-third in the woods and another third in the sawmill. The remainder leaves the mill as salable lumber. If you sigh at this waste of a precious natural resource, think how the lumberman feels about it. Timber is more expensive to buy than ever before, and he can market only a third of each log. Large stands are no longer plentiful, even in the Pacific Northwest where some virgin timber still grows tall and competition for it is keen.

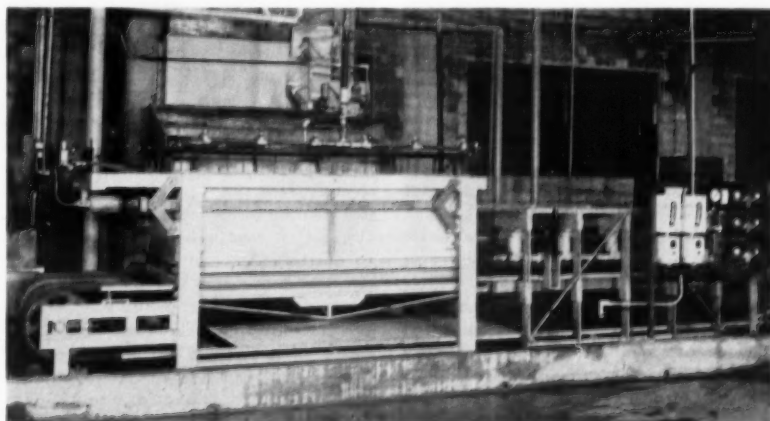
Astute lumbermen are doing everything possible to eliminate needless waste and to turn to account the material inevitably discarded in the logging and

milling processes. Recent laboratory discoveries in chemical and physical waste utilization have stimulated the imagination. And a growing realization that the progress and growth of the lumber industry are tied up with the diversity of products manufactured from wood has loosened the purse strings of investors in wood-waste ventures. But of all the schemes proposed, hardboard has captured the hearts of lumbermen.

Hardboard isn't new. In the East, the Masonite process has been consuming huge amounts of Southern Pine

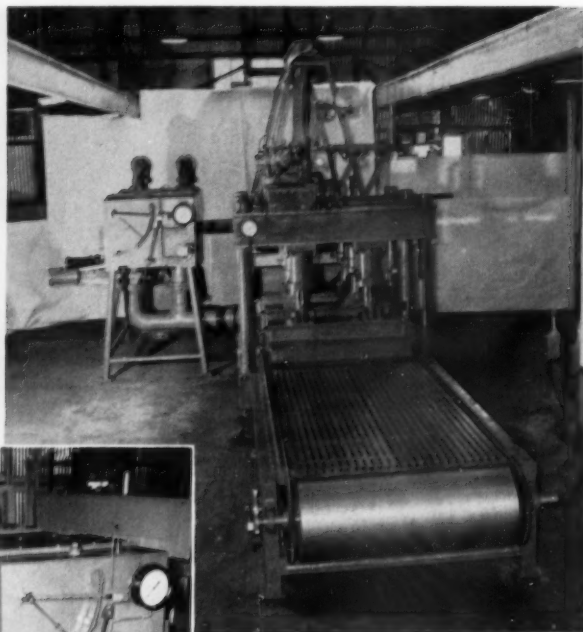
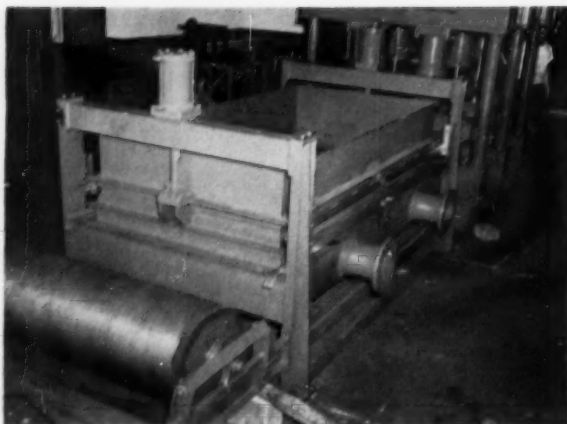
waste in its production since 1926. But in the West, which provides almost half of our lumber, hardboard plants were nonexistent until after World War II. Then Ralph Chapman began making the material out of Douglas Fir waste at Corvallis and laid the foundation for the business on the Pacific Coast.

The Chapman hardboard process—but one of many developed recently—has achieved international recognition because it requires a relatively low capital investment, uses a simple and inexpensive type of cold press, does not con-



MAT-FORMING INSTALLATION

The pioneer forming machine in the original Chapman plant at Corvallis. A slurry of wood fibers, plastic resins and water is deposited from a deckel box onto a screen which travels from left to right into an air-powered press.



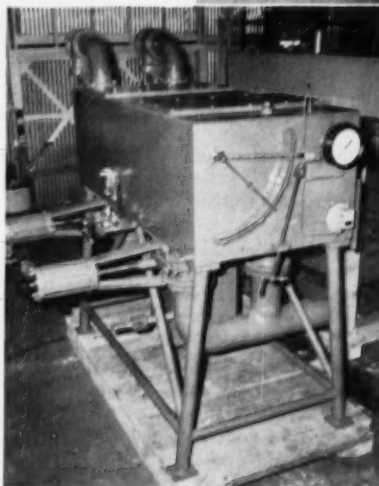
sume much power and has several inherent technical advantages over other methods. At the present time six plants based on the system are in service in the United States, Canada, Italy and in Japan.

Immediately upon entering one of the plants—whether it be in Oregon or in Naples on the other side of the Atlantic—the startling hiss of exhaust air and the sharp click of solenoid valves hint strongly that compressed air plays a key role in the operations. To make the process economically feasible, it must be as automatic as possible, and from the time waste from veneer plants and sawmills is dumped into storage bins machines take over.

First the wood slabs, trim and edging are fiberized—literally torn to shreds. These are dumped into water and mixed with the plastic resins that are required for binding, the amount and kind used determining the properties of the product. But to keep the price of the building material low enough to encourage you to use it, the resin content is kept as low as possible. The slurry, which was perhaps a wooden slab only a short time ago, must be formed and pressed to convert it into a panel of hardboard.

Forming is considered the most crucial phase of the operations, and it is at this stage that compressed air steps in and controls the cycle with unswerving accuracy and dependability. The batch or mixture of water, wood fiber and resin must first be converted into a mat by the use of what is called a deckel box, a term taken from the paper industry. The lower half of this ingenious unit rests on an endless screen, which later passes between the platens of the cold press. The upper section is raised or lowered by pneumatic cylinders. When the box is in the "down" position, air pressure forces the bottom edge, which is provided with a rubber seal, tight over the screen, creating a leakproof container for the batch.

Mat forming proceeds as follows: When the box is ready for service, a pre-



determined amount of slurry is poured into it from swing spouts, much like filling a swimming pool from the top. The screen lets most of the water flow through, leaving the wet fibers on the fine mesh. As soon as the spouts have completed their work they operate a switch which, in turn, actuates an air valve. The latter controls a vacuum pump that serves to remove more water from the soggy material on the screen. In this form it is called a mat and begins to resemble a board.

At the end of a set time cycle, which depends on the thickness of the board, the upper half of the deckel box is raised so that the screen with its superimposed load can be moved ahead into the press. While that mat is being compressed into hardboard, vacuum is at work preparing for the next one by drawing the water used in forming the mat now in the press into a chest called the "white-water tower," another term borrowed from papermakers. The tower acts somewhat like a water saver in an automatic washing machine—it holds water in reserve and pours it back into the box for reuse. When the water entering the tower reaches a predetermined level, a floating ball inside hits a limit switch, thus

COMPONENTS OF A HARDBOARD FORMING UNIT

Above—In the foreground is the endless screen that carries the soggy mat from the deckel box (hidden in the background) into the press pictured. In the left background is the "white-water tower," a water saver connected by piping with the lower part of the box. Its operation is air-controlled, as is the timing mechanism of the entire forming process. Top left—A view from the opposite end showing the deckel box and the air cylinders that raise and lower the upper section. Left—A close-up of the tower.

stopping the flow. The valves which police this action are actuated by compressed air.

Though a 50-cfm compressor would be sufficient to operate the pneumatic equipment in a Chapman process plant, a machine with a capacity of 125-cfm is usually installed because compressed air is also used to control instruments and to perform other services such, for instance, as running caul-plate grinders which remove caramelized material from the presses. Compressed air was chosen by inventor Ralph Chapman because it has several distinct advantages over any other source of power. It is reliable, economical both in initial cost and operation and insures accurate control as well as valuable cushioning.

Hardboard is mostly produced in standard building size—4x8 feet—and is marketed and handled much like plywood. Each panel that comes off the press is a tribute to man's ingenuity, which is making it possible to turn waste into wealth. The house on the hill in the Willamette Valley built from Chapman Hardboard stands as a symbol of what can be done with waste wood.

THE trend towards the use of high-strength bolts in steel construction continues. Their utilization is gaining not only in buildings but also in railroad bridges and other structures. Many municipalities have revised their building codes to permit replacing rivets with bolts.

Russell, Burdsall & Ward Bolt & Nut Company, a leading maker of bolts, has issued a bulletin that discusses high-strength bolting practices and gives information of value to users. Among the advantages of the new technique listed are: greater strength than riveting, less inspection, safer and quieter application, tighter bond and savings in time and cost of erection.

Bolts insure a stronger structure than rivets against the forces of tension, fatigue and shear, it is maintained. As air-powered wrenches, particularly the new torque-control type, make it possible to run every bolt to the desired tightness, 100 percent inspection such as is common in riveting is not required. Because there are no fires and no flying rivets, bolting is obviously safer. It is also quieter, which makes for easier communication on the job and better public reaction. As bolts stay tight well-nigh permanently they seldom have to be replaced. Less reaming of holes and lower fitting costs result in savings.

High-strength bolts are identifiable by three radial dashes on the head.

Bolted Buildings Gaining Fast

They are made of high-carbon steel and given a specified heat treatment that not only strengthens them but also gives them a distinctive black color. They have a hexagonal head and are semi-finished, which means that they have a smooth washer seat under the head to carry the load when the bolt is tightened.

They have two to three times more tightening strength than common machine bolts: for example, 40,800 pounds as against 18,370 pounds in the $\frac{3}{4}$ -inch size. Consequently, if an ordinary bolt is run by mistake no harm will be done, because it will fail and call attention to the error before the tightening torque prescribed for a high-strength bolt is reached.

It is reported that ironworkers like bolting. The wrenches used are not very heavy and have little torque reaction that might dislodge the handler. They do their work without the application of pressure. Also, unlike riveting, bolting can be learned quickly and, thanks to the torque-control tools now available, it does not take very long

for an operator to become an expert.

Russell, Burdsall & Ward recently supplied 70,000 bolts of high-tensile strength for use in enlarging at a cost of \$9,000,000 the seamless-steel specialties division at Jones & Laughlin Steel Corporation's Aliquippa, Pa., works. This is believed to be the largest construction job carried out to date with these fasteners. In addition to a 125x1055-foot production building, the project included a 100x375-foot addition to the adjacent seamless mill and a 100x325-foot shipping building.

One advantage of bolts cited in this instance is their resistance to vibratory impact caused by running heavy machinery and by stress loading resulting from the use of overhead cranes. Two 15-ton and two 10-ton cranes will be in service in the mill.

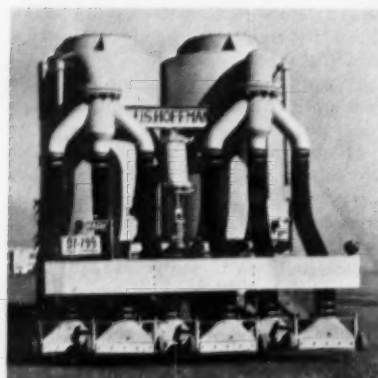
Standard machine bolts were used for fastening roof purlins, wall plates and sheeting girders. Truss sections were assembled on the ground, swung into place by crane and fastened by ironworkers aloft. Only 2-man crews were required for the bolting operations.



BIG BOLTING JOB

More than 70,000 bolts were used in erecting additions to the Jones & Laughlin seamless-steel mill (above). Truss members were tied into the top of the old building by drilling the structural members and fitting the existing steelwork with adapter plates. One of the new Ingersoll-Rand 5340T torque-control Impacttools is in action at the left.

Airport Vacuum Cleaner



A GIANT vacuum sweeper, perhaps the world's largest, was demonstrated recently at the Anacostia Naval Air Station, Washington, D.C., for Defense Department officials. Dubbed the "Jarc" (Jet Aircraft Runway Cleaner) by its manufacturer, the U.S. Hoffman Machinery Corporation, the huge mobile unit is designed for cleaning airfield runways used for jet-aircraft operations. It is expected greatly to reduce engine damage and maintenance costs resulting from foreign materials that are "sucked in" through jet air-scoops.

Expenditures by the Defense Department just for engine repairs and replacements attributable to this type of accidental injury are estimated to exceed several million dollars annually. U.S. Air Force experiments have proved that a small solid object such as a nut, bolt, screw, stone or piece of wood can either entirely destroy or critically damage a jet engine into which it is drawn.

Immediately after entering the air-scoop, the object meets the jet turbine blades and normally causes well-nigh complete disintegration of this vital part, as well as of the remainder of the engine, in a matter of seconds. To combat this problem, Air Force engineers placed a wire screen inside the air-scoop near its mouth. Tests have shown that the mesh must be large enough not to obstruct the air flow to the engine. In consequence, the screen does not keep out pieces small enough to pass through the openings. The only real guaranty against picking up foreign objects is to remove them from the runways, warm-up areas and hangar aprons. With this in mind, engineers of U.S. Hoffman's Air Appliance Division developed the Jarc.

Weighing about 30,000 pounds and around 30 feet in length, the Jarc can



SWEEPING A RUNWAY

With its nozzles in working position close to the surface (above) the machine moves down a runway. A rear view (left) shows the six nozzles which cover a swath 8 feet wide.

clean and remove all debris from a two-million-square-foot area in about eight hours. The equipment is mounted on a specially designed White Motors truck body. Two heavy-duty industrial exhausters provide suction for the system and are equivalent in energy to 1200 home-type vacuum cleaners.

The actual vacuum surface is made up of six ground-level nozzles arranged at the rear throughout the 8-foot width of the vehicle. They suck in air at a speed of 350 miles per hour, and U.S. Hoffman officials estimate that the volume handled would sustain the breathing of 25,000 persons. When not in use the nozzles are raised pneumatically to a standby position. Each is equipped with two small wheels on which it rolls along the runway. The material picked up is carried through pipes to collectors, each of which is fitted with a special door to dump the contents after operations are completed.

Heretofore, runway cleaners have been of the conventional moving-brush type or been provided with large magnets to pick up foreign matter. The

first-named tend to spread the debris around—do not adequately dispose of it; magnetic sweepers will pick up only ferrous objects. Therefore, neither handles all types of materials. The Jarc, on the other hand, will remove anything from paper and cloth to ferrous and non-ferrous metals. During the showing it thoroughly cleaned an area littered with steel, aluminum, sand, gravel, paper, wood, etc. Another advantage is the fact that one man is able to run the vacuum equipment as well as the vehicle thanks to an integrated setup of instruments and automatic controls. The control panel contains an estimated 600 feet of electrical wire.

Prior to the demonstration, Revis L. Stephenson, vice-president of U.S. Hoffman, said: "Along with cutting down excessive maintenance expenditures, systematically cleaned airstrips will be instrumental in maintaining the aircraft industry's great safety record as it moves into the jet age."

Improved Abrasive

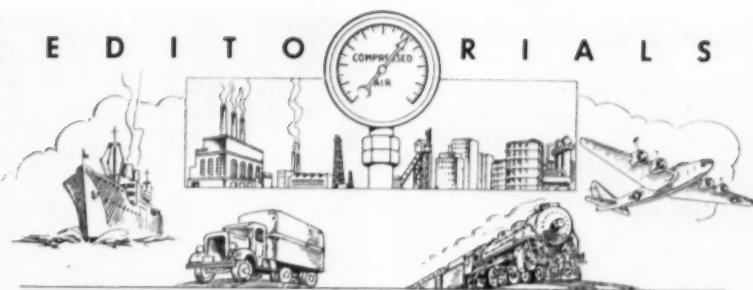
UNDER the name of Steeletts, Wheelabrator Corporation is offering a high-carbon, electric-furnace steel abrasive heat-treated to give it the toughness needed for blast-cleaning operations. The grit is in the same hardness range as chilled iron abrasives but free from the brittle carbides that cause breakdown. It is claimed that the particles do not fracture upon impact; that they retain their shape after hundreds of cycles; and that embedment in the work is reduced because of the lack of cutting edges. Steeletts are recommended for such operations as providing metallic surfaces with a deep etch for bonding with varied coatings; for descaling alloy forgings and heat-treated parts; and for etching steel-mill rolls. The abrasive is made in seven sizes from G-16 down to G-120, all screened to SAE specifications.

Circle 1E on reply card



THE HARVEST

Picked-up material being removed from one of the collectors following the demonstration in Washington, D.C.



JUSTIFIED GENEROSITY

IT IS no secret that our forefathers who settled America often gave the Indians little or nothing for the land they took over from them. Now, as though to make up for that unfairness, there is a tendency to give the Redmen something more than an even break.

A case in point is the question of how much the Crow Tribe should receive for land that is needed to construct the Yellowtail dam and reservoir on the Big Horn River in southeastern Montana. An appraiser, employed by the Bureau of Indian Affairs in 1950 to determine "just compensation" for the 5600 acres involved, said \$36,000 would represent a fair market value. In other words, he thought that would be as much as the land would bring if offered for sale under normal circumstances. Although that was six years ago, nothing has happened since that time to change the appraisal substantially. The land, which is a part of the Crow Indian Reservation, is mostly in the precipitous and virtually uninhabited canyon of the Big Horn River.

However, the Bureau of Reclamation, which is the Government agency that will build the dam, offered the Crows \$1,500,000 for this tribal property, and the Indians refused it. The Department of Justice then instituted condemnation proceedings in the Federal District Court of Montana. Now Secretary of the Interior Douglas McKay has recommended that The Congress pass legislation authorizing payment of a sum not to exceed \$5,000,000.

The secretary is asking the solons to agree with his viewpoint that the principles governing the case are a little out of the ordinary. Actually, the Government, and particularly the Department of the Interior, is essentially a guardian or trustee of the property involved. Nevertheless, the Government is endeavoring to acquire the land for purposes of its own. After weighing all the facts, the secretary expressed the opinion that the offer of \$1,500,000, which is 40 times the amount previously set as the "fair market value," is indeed fair and equitable. He also stated that substantial benefits may accrue to the tribe from the Yellowtail Project.

Considering how much the Indians gave up to the colonists, and that much

of the land set aside for their reservations is, ostensibly, among the poorest in the nation, we believe that few Americans will censure Uncle Sam if he is inclined to be a little overgenerous in this instance. One can hardly arrive at any other decision if one bear in mind how freely funds and other practical gifts have been bestowed in recent years on peoples far from our shores.

RECRUITING ENGINEERS

A POPULAR song of World War I days posed the question as to how young soldiers might be kept "down on the farm" after they had seen the sights of Paris. There was, in fact, a distinct movement away from the soil during that period. One of the ways the agriculturists combated it was to organize 4-H clubs among the growing boys and girls. Thus an interest in farming was kindled early and many adolescents who might otherwise have chosen to go elsewhere followed in the vocational footsteps of their parents. The 4-H and other farm groups have continued to serve this purpose.

The engineering profession is now adopting a similar tactic in an attempt to funnel more high-school graduates into technical colleges. An organization called the JETS (Junior Engineering Training for Schools) now has 75 clubs in eighteen states with an aggregate membership of more than 2000 boys and girls of high-school age. The idea originated with Lorin G. Miller, former dean of engineering at Michigan State University in Lansing, Mich. The first club was formed in East Lansing High School in 1950, and headquarters are still maintained at Michigan State. It is a storehouse of engineering information, including an index of more than 100 motion pictures about various phases of engineering that are available without cost. There is a club newspaper, and each member is given a lapel pin supplied gratis by Keuffel & Esser, a New Jersey manufacturer of engineering equipment.

The purpose of the JETS is twofold: to stimulate interest in engineering among secondary-school students who have a bent for it and to dissuade those whose talents lie in other fields from at-

tending technical colleges. At present many who start engineering courses drop out, and that has been called "an economic waste." In general, only those who like mathematics and other less glamorous technical subjects should enroll.

The JETS program, it will be noticed, was organized by a university. It is, in effect, an effort to recruit future college students from the lower ranks, much as major-league baseball teams foster interest in the sport by providing "schools" for youngsters and then maintaining minor-league teams or "farms" for their preliminary training.

Actually, industry is more interested than colleges in more graduate engineers, and it is industry that should be selling engineering careers to teenage youngsters. It is encouraging to note that this obligation is being increasingly recognized and carried out. More and more firms are setting up scholarships, establishing evening classes for their employees and sending more of them back to universities for additional training.

One cogent reason for the growing need of technical people is that the number of industries based on engineering or scientific principles is on the increase. Indeed, whole new sciences such as electronics and atomic energy have come along, and others may emerge. One authority says that in the next 25 years at least 23,000 more engineers and scientists will be required in the field of civilian atomic energy alone. To meet this demand we should be training two or three times as many as we are.

Many of those who are closest to the problem are of the opinion that it could best be solved by bolstering the teaching profession at the high-school and preparatory-school levels. The teachers of mathematics and science in these institutions are in contact with the students at a time when they are making up their minds whether to go on to college and, if so, what courses to choose. The instructors can detect any lurking talents and stimulate an interest in further study. Industrial scouts who now comb the engineering schools for prospective employees will perhaps someday go down into the "minor leagues," so to speak, and sign up promising technical students in their precollege years. These youngsters may then even be sent through college by their future employers, who may suggest courses that will best qualify them for the jobs they will fill later.

Recognizing the important roles of these teachers, some industrial concerns are sponsoring advanced technical training courses for them so that they will be able to give their students, in turn, a better foundation in preengineering subjects. Another way of strengthening the secondary schools is to boost teachers' salaries. Higher pay both deters good teachers from leaving their jobs and also attracts competent new ones.

Fly It, Then Carry It



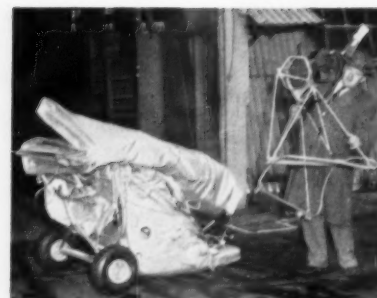
FLYING AND DEFLATED

Pilot Dick Ulm is shown above test-flying the plane at an Akron, Ohio, field. At the right, Goodyear Engineer Roger L. Wolcott shoulders the engine and its tubular support. In front of him are the wing and tail assemblies and the seat section.

AN INFLATABLE airplane that can be deflated and packed in the trunk of an automobile has been flown for the first time at Wingfoot Lake Airship Base, Akron, Ohio. Designed and developed by Goodyear Aircraft Corporation to test the possibilities of Airmat, a rubberized structural fabric for aircraft, the lightweight plane is made rigid by air

pressure. Expanded with less pressure than that required to pump up passenger-car tires, it resembles a glider with the pilot seated in front; deflated, it can be stowed in a small space.

Wing, tail assemblies and pilot's seat are of the Airmat material, a Goodyear Tire & Rubber Company product consisting of joined layers of inflatable rub-



ber-covered nylon that is fashioned of thousands of pile threads. The conical fuselage of the craft is made of airship fabric.

The single-place, high-wing monoplane has a 2-cycle, 40-hp motor mounted on a tubular support above the fuselage directly behind the wing. The only other metal support connects the wheels and pilot's seat with the fuselage. High-strength, fan-shaped patches of rubberized fabric are used to attach the various members, struts and other supports.

Goodyear Aircraft Corporation designed and built the plane in a little more than twelve weeks. It is the first of its kind in the United States. Until further development is completed the company is withholding additional information on this unusual structure. Quantity production is not planned.

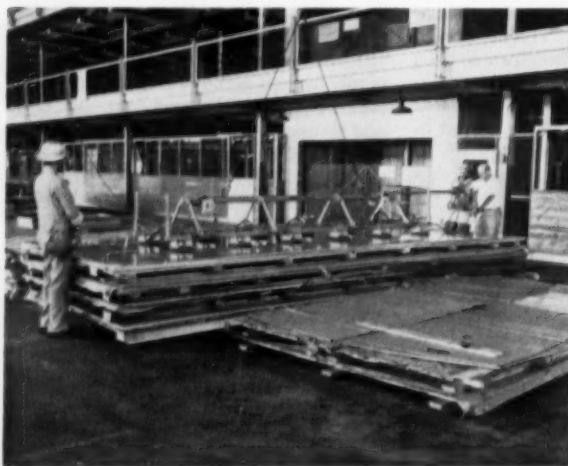
Vacuum Spatula "Flips" Big Sheets

SHIFTING 800 pounds doesn't seem like much of a chore in these days of giant cranes and hoists. But when the object is a sheet of aluminum alloy 8x21 feet in size and only $\frac{5}{16}$ inch thick it's a matter of awkwardness rather than weight. Convair Division, General Dynamics Corporation, San Diego, Calif., is doing the job with a special lifter designed by Merle Stevens of its plant en-

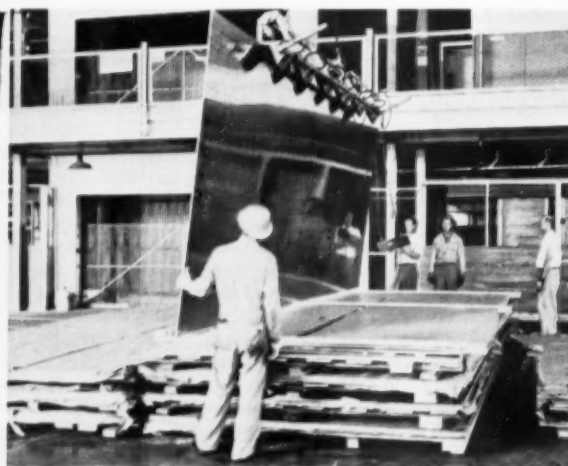
gineering staff. Of the vacuum type, it not only transfers sheets from one pile to another but also flips them over for inspection.

The unit is made up of twelve suction cups, each with a lifting capacity of 400 pounds. They are arranged in six sets of two each and fastened to a triangular framework hinged on the transverse axis so that it can "wrap" itself around the

sheet when hoisted and enable one row of cups to attach themselves to the underside. When used for turning, the rig is placed along one edge of the plate; for ordinary transfer service it is locked open (at 180°) and positioned at the center. Vacuum is drawn independently on each cup so that failure of any one will not cause the load to drop. All controls are situated on a central panel.



READY TO TRANSFER A SHEET



FLIPPED UP FOR INSPECTION

This and That

Pipe Made in Trench One of the newest machines in the construction field manufactures concrete pipe right in the trench where it is laid. The unit is powered by a gasoline engine and pulls itself along at a snail's pace by means of a cable attached to a deadman ahead. Concrete is fed into the machine from a ready-mix truck and distributed around collapsible aluminum forms that are inserted into the unit and hooked together. The forms determine the inside diameter of the pipe. The outside walls are shaped by the machine, which includes an electric vibrator to consolidate the concrete. A curing compound is sprayed over the top of the pipe soon after it is formed.

One of the units recently laid 5 miles of 30-inch pipe to carry irrigating water on the Salt River Project in Arizona. On that job 650 feet of forms in 4-foot lengths were used, and an average of 550 linear feet of pipe was built daily. The aluminum forms were left in place overnight as a support and were collapsed and withdrawn for reuse the next morning. Patents on the continuous, no-joint pipe-making method and rights to manufacture the machine are held by G.D. Williamson, of Yuba City, Calif.

★ ★ ★

Air Drives For Plane Accessories General Electric Company has developed a pneumatic drive for airplane accessory equipment used throughout the Air Force's newest long-range, jet-propelled bomber, the Boeing B-52 Stratofortress. According to a spokesman for Boeing Aircraft Company, this is the first time an aircraft's complete accessory system is being operated by drives of this type. Designed to supply either electric or hydraulic power, they obtain their air from the jet-engine compressor. Each unit consists of a turbine, reduction gears and controls. Unlike conventional accessory power equipment that is mounted directly on the airplane engines, air-turbine drives can be installed in remote locations close to their points of use, and the range of their ratings is said to be virtually unlimited.

★ ★ ★

India's Mineral Wealth India's natural resources, having been exploited so little, may contribute inestimably to her future economic stature. She is, for example, in an enviable position as regards nuclear fuels, if her own appraisals are accurate. According to the Embassy of India in New York, Dr. J. C. Ghosh, a member of the India Planning Com-

mission, recently declared that the nation's unmined supply of uranium and thorium is great enough to maintain a standard of living equal to that of the United States for 200 years. He reports that 15,000 tons of uranium and 180,000 tons of thorium could be extracted from their known ores. India's iron-ore reserve is estimated at 10,000 million tons.

★ ★ ★

Tools On the Farm A survey conducted by the magazine *Countryside Marketing*, published in Philadelphia, Pa., indicates that the average American farm is a good place to sell power tools. Increasing mechanization is steadily boosting the need for farm workshops and for the range of equipment in the shops. A check of 7000 students of vocational agriculture in 143 high schools revealed that one-third of them lived on farms that had workshops. A detailed inventory of 110 of the latter showed an average investment of \$675 in hand and power tools. Bench grinders and power drills (usually 1/2-inch portable models) were the most numerous, being found on 80 percent of the places. Next in number came air compressors, available on 64 percent. The greatest use of air is probably for inflating tires on cars, trucks and field machinery. Next in importance, apparently, is paint spraying, as 44 percent of the farms owned spray outfits.

★ ★ ★

Shrouds For Sinners Asbestos paper is now being manufactured for special applications by Raybestos-Manhattan, Inc., at Stratford, Conn. The heat-resistant material is so far serving chiefly as insulating tape for shipboard electrical cables prepared to Navy specifications, but other possible applications are being investigated. It can be used alone or in laminates with glass cloth and may be impregnated with standard resin binders such as phenolic, polyester, epoxy, etc.

The first step in producing the paper is to subdivide the bundles of fibers that make up the mineral chrysotile. The finest filaments can be seen only under an electron microscope, human hairs being coarse by comparison. A chemical method has been developed to effect the separation. From there on the procedure is generally similar to that followed in conventional papermaking, but it is carried out in a specially designed machine.

The asbestos fibers, together with varying quantities of fiber glass, are combined with water, and the pulp is distributed on a screen and carried over two flat boxes in the machine, where a vacu-

um of from 2 to 10 inches of mercury is applied to extract moisture. Then it passes to a suction transfer roll where a higher vacuum removes more moisture. Next it goes over a steam-jacketed roll and finally to a wind-up drum. The product is snowy white and is 40 inches wide when trimmed.

Six grades of the Novabestos paper are being manufactured with the asbestos content ranging from as little as 5-10 percent up to 90-92 percent. Some grades are made in three thicknesses or gauges. For shipboard cable insulation, the paper laminates are interleaved with glass yarn laid in the longitudinal direction to make a "sandwich" about 0.01 inch thick which is slit into ribbons.

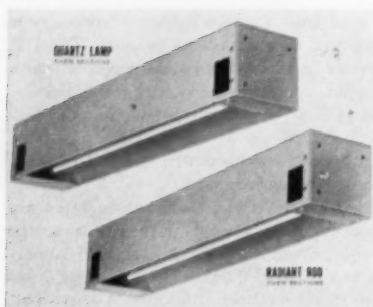
★ ★ ★

Rain Upon Order Americans seem to be divided on the effectiveness of measures designed to bring rainfall, but Dr. E. G. Bowen, head of the Australian Commonwealth Scientific and Industrial Research Organization told a gathering of scientists recently that "it has been proved beyond doubt that artificial rain can be made to fall in Australia." Doctor Bowen has collaborated with American scientists in experiments in Colorado and Hawaii. In Australia silver iodide has been used as the cloud "seeding" medium. Although it is admitted that further research is necessary to determine what can be done under varying atmospheric conditions, the group working on the project is confident that rainfall can be increased by 10 percent and estimates that that is sufficient to boost crop production by 25 percent in the areas affected.

★ ★ ★

City In the Making The uranium rush is adding many dots to the world's maps. In the Blind River section of Canada, which had few inhabitants five years ago, a townsite designed to accommodate 12,000 to 15,000 people is being laid out. It will be the trading and residential center of the 396-square-mile Improvement District of Elliott Lake, which was set up by the Ontario Government when it became apparent that uranium mining would bring in large numbers of permanent residents. Sites for industrial, commercial and other business uses will be rented to the highest bidders who can show that they are prepared to provide adequate services. Mines Minister Philip T. Kelly predicts that the camp's mining activities will soon compare favorably in size with those in the Sudbury nickel-copper area.

Industrial Notes



Two new types of radiant heating equipment with a wider than normal range of drying, preheating, baking, dehydrating and curing applications have been developed by The Fostoria Pressed Steel Corporation. The units have sources of infrared heat that differ considerably from those of the well-known bulb type and come in sections of varying dimensions that can be quickly interlocked side by side or end to end to form complete ovens of well-nigh any size and shape. One, the T-R, is a quartz lamp. It is capable of providing product temperatures in excess of 1000°F and is especially well suited for high temperature-short cycle operations where instantaneous response is required. The other, known as the Radiant Rod Oven Sec-

tion, incorporates sheathed metal elements as the source of energy and was designed to meet the need for an efficient low-cost far infrared unit for rugged service. Both can be installed in or assembled as additions to most Fostoria ovens now available.

Circle 2E on reply card

For nearly two years Eastman Chemical Products, Inc., and Egyptian Lacquer Manufacturing Company have been experimenting with a clear water-white lacquer developed jointly to protect aluminum trailers against corrosion and pitting. According to a report on a comparative test with an uncoated and a lacquered body, the former began to show signs of deterioration and took much longer to wash after 10,000 miles on the road than the other, which remained bright. The coating can be applied with ordinary spray equipment and dries in about ten minutes at room temperature. In the case of new aluminum no primer is required, but grease, wax, and foreign matter should be removed before application.

Circle 3E on reply card

What is described as a low-cost, high-speed die-casting machine with all the features of larger, costlier units, has been

announced by American Die Casting Machinery Company. Of all-steel construction, it has a 6½-inch stroke, is designed for automatic cycling and is said to produce castings ranging in weight from 1 ounce to 2½ pounds. Maximum capacity, 700 shots an hour. Two types are available: a gooseneck machine with an air or hydraulically operated plunger and blower-type furnace for zinc, tin and lead and a cold-chamber model for aluminum, brass and magnesium.

Circle 4E on reply card

Vac-U-Max is the name of a new industrial vacuum cleaner based on the aerodynamic principle that compressed air, passing through a jet venturi, creates a high vacuum. A product of J.P. Glasby Manufacturing Company, the unit is ready for service when connected to a shop air line and can be used



for dry or wet pickup and for handling either disposable or reusable waste. The solid material is collected in a burlap bag placed within the 20-gallon container and the liquid is discharged from the bottom through a drain cock. Air consumption is said to be low, 25 cfm, and suction strong enough to permit removing normally hard-to-loosen deposits from inaccessible parts of machinery and equipment. Without a motor or moving parts, the cleaner requires little maintenance and operates without risk of explosion.

Circle 5E on reply card

Conversion from hand operation and control to semi- or complete automation is possible, it is claimed, by a new heavy-duty feed that can be attached to any drill press, milling machine or other tool where controlled power is required to rotate a drive shaft. The unit consists of a Lehigh reciprocating air motor or cylinder and of a rack and pinion that is driven by the motor and automatically lowers or retracts the quill assembly of the press at a preselected speed. The cylinder has a built-in control valve and is operated from a shop air line. The outward stroke makes full use of the

NON-FLUID OIL

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FIGHTS FRICTION & RUST IN COMPRESSED AIR EQUIPMENT

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- *Increases tool speeds by 10% to 30%
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Write for free testing sample, and see why it is approved by all leading manufacturers of air tools, and used by the majority for the initial run-in after assembly.

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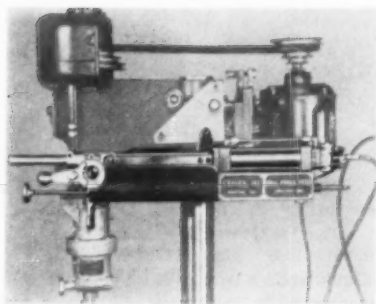
WAREHOUSES

Birmingham, Ala.	Greenville, S. C.	Greensboro, N. C.
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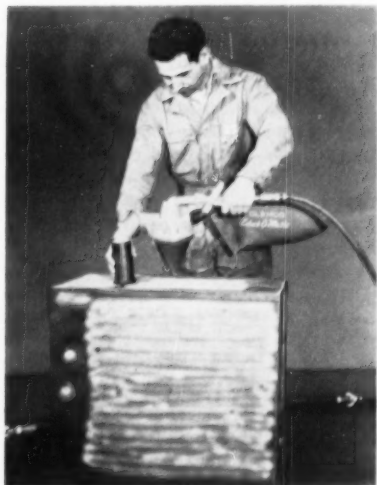
Circle 16A on reply card



power and is hydraulically checked at a set point to give the work stroke controlled speed and thus lessen the chance of drill breakage at the point of break through. An integral impulse switch permits complete electrical sequencing with other equipment such as rotary tables. Present models have air motors of 2- or 3-inch bore and provide full 360° pinion shaft rotation with 3 3/8-inch drill-press stroke on most machines. Advantages claimed for the feed are higher than normal production per hour with less operator fatigue.

Circle 6E on reply card

Abrasive cleaning is usually associated with heavy equipment. While that is still true for certain jobs there are many others that can now be done, it is claimed, with a device that is akin to a hand vacuum cleaner. Developed by Clementina Ltd., it weighs only 11 pounds complete with dust collector, hopper and charge and is ready for service when connected to a 1/2-inch line supplying air at 90 to 100 psi. Consumption ranges from 33 to 60 cfm, depending upon the operating pressure and size of the nozzle. The unit is provided with a swivel blast head which permits holding it in any position to remove paint, oil, weld spatter, rust or mill scale from floors and ceilings, inner and outer surfaces of tanks, etc. Various abrasives such as malleable shot, grit, aluminum oxide and



walnut shells may be used and are recovered—returned to the hopper—by suction created in a housing formed around the area being cleaned. The dust is drawn through the body of the machine and collected in the attached bag. In the accompanying illustration, the worker's left hand is gripping the single lever by which the Educt-o-matic is controlled. Should his hand slip, a safety feature stops operations.

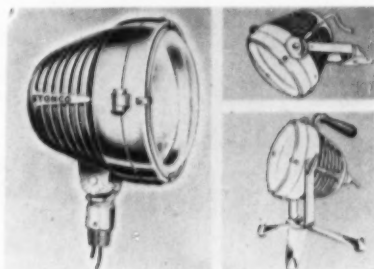
Circle 7E on reply card

Synthetic mica has been bonded with high-grade electrical glass to form an insulating material that is said to resist temperatures up to 1000°F and the effects of radiation without losing its properties. A product of Mycalex Corporation of America and named Supramica, it is said to be impervious to water, oil and organic solvents and to insure permanent dimensional stability, low electrical loss and good arc resistance.

Circle 8E on reply card

Stonco Electric Products Company has announced a new outdoor floodlight designed especially for service where the lamps must be installed at a considerable distance from the place to be illuminated. Identified as No. 64, the unit is rated at 500 kilowatts and concentrates its entire output of 115,000 candlepower in an oval beam of high

intensity. It is constructed of cast aluminum with heavy internal and external ribs that double the cooling surface; is cradled against shock in a rubber cushion; and sealed watertight by a hinged cover ring with heat-tempered lenses. For long-range floodlighting of large, wide areas and mounting in clusters it is available with wiring troughs, splice boxes, and wall or pole



fittings; for spotlighting, it is provided with a degree-marked aiming quadrant and locking teeth to fix the focus; and for mobile use it comes with a carrying handle, a quick-connect socket and cord and a nonslip tripod. The lamp is said to have a service life of 2000 hours.

Circle 9E on reply card

Under the name of Ultra-mation Cylinders, Logansport Machine Company has introduced a new line of nonrotating,



A COMPLETE LINE OF AIR CONTROL EQUIPMENT

Including precision-made **HEAVY-DUTY**

AIR MOTORS

WITH "SEALED-IN LUBRICATION" Pat. Pend.

Wide choice of electric and/or air controls and mountings. For air pressures up to 200 P.S.I.
Bores: 1 1/2"-2"-3"-4"-5".
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"Sealed-in Lubrication"
Assures low break-away on long idle units — ample sealed-in oil for thousands of cycles without attention.

"Sealed-in Lubrication"
AIR CYLINDERS
1 1/2" to 8" bore



You Are Invited To Consult Our Engineering Department
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Panel units, hand and foot operated valves. Wide range of models.



Lehigh Minor AIR VALVES and CYLINDERS
Low priced, light duty. For air operated jigs, fixtures, high speed operations.



KEEP YOUR NAME OUT OF THIS HEADLINE

Blast Levels Compressor Building XXMZQP Co.

At 9:55 this morning, a severe blast shook the area surrounding the Co. A light frame power auxiliary building was severely damaged and windows of adjacent structures were blown out. The West Side Fire Company responded to the alarm. Two men were sent home after being treated for injuries by the fire company.

Company Officials were not immediately available for official comment, although a shift foreman reported that the building contained a battery of air compressors and receiver tanks, used to supply the plant system. It not been reported as to whether accident will

With an

ADAMS Aftercooler in your compressed-air system

Annually, thousands of dollars in time and money are lost by compressed air fires and explosions. More such accidents will occur—which could easily be prevented by the proper design of air systems.

Aftercooler is the Answer

An aftercooler is installed between your air compressor and receiver primarily to condense water and oil vapor. They are then removed in the liquid state, thus eliminating the major source of "fuel" for compressed air fires. Secondly, what little oil vapor remains, is cooled well below its flash-point, so that there is little danger of an internal source of ignition causing an explosion or fire.

In the event of a "flash", in or directly after a compressor, the shell and tube aftercooler rapidly dissipates the resulting heat of combustion. So, the flame front can not propagate into the receiver—and cause a more serious explosion or fire.

Added Advantage of an ADAMS Separator

In an ADAMS designed unit, the condensed water and oil as well as any entrained mist is efficiently removed by the cyclone separator. In this way, air, essentially oil and impurity free, is stored in the receiver—and your system is completely safe from an internal fire hazard.

New Aftercooler Bulletin

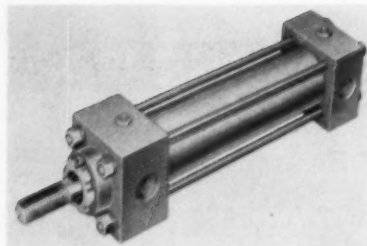
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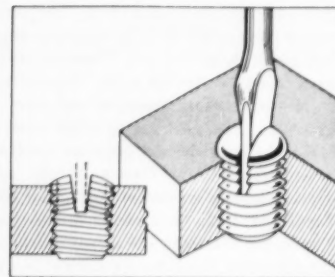
Circle 18A on reply card



double-acting, square-end cylinders previously built only on special order for difficult high-production jobs. These heavy-duty units have corrosion-resistant tubes, high-quality steel pistons, extra-heavy piston rods to carry high impact loads, and rod wipers of synthetic rubber. They are available in five bore sizes—2 to 6 inches—for pressures up to 150 psi, air, and 500 psi, oil, in five basic mounting styles and with interchangeable steel-plate covers. Unobstructed ports of adequate size can be relocated to any 90° position by rotating the cover. Cushioning may be specified for either cylinder end or both ends.

Circle 10E on reply card

Under the name of Spred-Lok, the Set Screw & Manufacturing Company has introduced a headless, self-locking set screw especially suitable for soft-metal applications. In the process of production the top of the screw is spread slightly, causing a locking action when driven by taking up the "flow" of the soft metal.

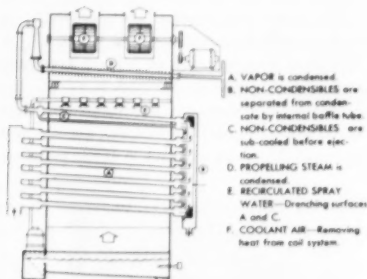


It calls for a screw driver with parallel shanks so engagement is at the bottom of the slot. Then, by moving the tool from side to side, the lock can be made more secure, if desired. The screws can be removed for reuse without any appreciable loss in locking efficiency, it is claimed. Technical data about the new fastener and samples may be obtained by writing to the company at 146 Main Street, Bartlett, Ill.

Among the new products announced by Minneapolis-Honeywell Regulator Company is a pneumatic transmitter that converts process temperatures from minus 375 to 1000°F or pressures from 40-600 psi to 3-15 psi output. The instrument operates on the force-balance principle, is shock mounted and compensates for ambient temperature and baro-

metric pressure changes. It is designed primarily for food, chemical and petroleum industries where close control and adaptability are required.

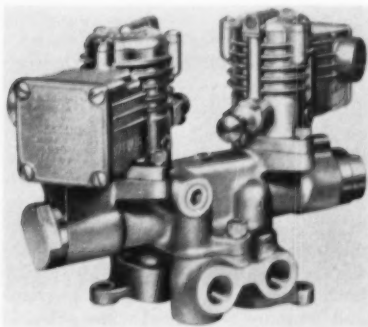
In a new vapor condenser designed by Niagara Blower Company cooling is effected by the evaporation of moisture on the surface of the tubes through which the vapor passes. Mounted on top of a stripping column or above a vacuum kettle, it forms a self-contained system for use in the process and food industries. Heat from the coil surface is exhausted directly into atmosphere by a fan-in-



duced air stream; water sprayed over the coils is recirculated; and noncondensable gases are separated from the condensate by a baffle tube in the manifold into which the liquid drains. The non-condensables are ejected by a vacuum pump or a steam ejector nozzle but are first subcooled so that most of the entrained vapor is condensed and returned through reflux tubes. Their volume and weight is thus minimized. By means of the apparatus, which is trade-named Aero Vapor Condenser, condensing temperatures within 20° of atmospheric wet-bulb temperature are practical, it is said, and a high vacuum can be maintained economically.

Circle 11E on reply card

Valvair Corporation has announced a new double-solenoid, pilot-actuated 4-way valve built to JIC standards. Known as the double-solenoid Speed King, it is said to require only momentary electrical contact for operation and to be capable of controlling up to 600 cycles per minute. Pilot solenoids and valve are fully enclosed against dust and moisture; sole-



18 TYPES OF PRODUCTS TO MEET YOUR SPECIFIC NEED

Here's a GALAXY OF FRANCE PACKINGS and PISTON RINGS

used by

LEADING COMPRESSOR BUILDERS
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- and many other types of rings and packings for special operations.

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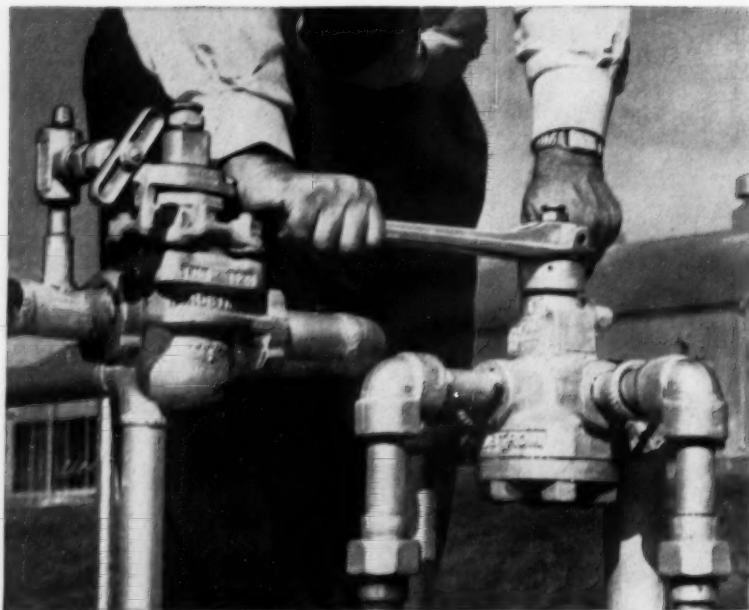
Name

Title

Company

Address

Circle 19A on reply card



JUST ONE Rockwell-Nordstrom Multiport Valve Does the Work of 2, 3 or 4 Ordinary Valves

For multiple flow control, you can switch from one line to another *instantly* by operating only *one* Multiport valve instead of 2, 3 or even 4 ordinary valves. Just three of the many possible switching combinations are diagrammed below.



In addition to original installation savings, Multiport valves continue to save because they're built to *stay* efficient. *Pressurized lubricant* forms a positive seal between the plug and body and also protects against corrosive-erosive elements. The seat is *never* exposed to the line fluid and the plug rides on a cushion of lubricant for *instant, quarter-turn* operation.

Rockwell-Nordstrom Multiport valves (and the complete line of *Straightway* patterns) are available in semi-steel, stainless steel, bronze and other corrosion resisting metals. Write for complete details: Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee: Peacock Brothers Limited.*



Rockwell-Nordstrom Valves

LUBRICANT SEALED FOR POSITIVE SHUT-OFF

40th YEAR of lubricated plug valve leadership

Circle 20A on reply card

noid coils are covered with molded epoxy resin; and valve body and stem are of bronze and chrome-plated stainless steel, respectively. According to the company, the normal service life of the unit is conservatively estimated at 20 million cycles. It is available with foot or sub-base-type mountings in pipe sizes from 1/4 to 1 inch and in varying pressure ranges, depending on the service. Optional features include manual override for use during machine setup and a junction box with a removable cover, which are incorporated in the valve shown.

Circle 12E on reply card

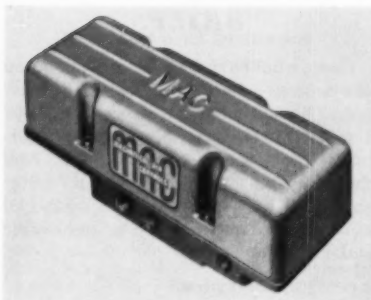
To meet the need of plants with 3/4- and 1-inch compressed-air lines, C. A. Norgren Company has added two new and larger sizes to its stock of air-line filters with automatic drainage facilities. Both are designed to create a strong centrifugal force to extract a high percent-



age of moisture from the air stream and are available with three types of filters to remove solids—a standard 200-mesh wire screen (74 microns) and 64- and 25-micron sintered-bronze elements. A float-actuated drain mechanism discharges moisture under constant or fluctuating air pressure with or without air flowing, and there is a protective device to prevent the entry of solids.

Circle 13E on reply card

Two models of a new 3-position, 4-way double-solenoid air valve have been announced by Mechanical Air Controls, Inc. The device features a neutral position and is available with either open or closed centers. In the case of the latter, Model 1023, the ports are blocked against pressure and exhaust when solenoids are deenergized, holding the rod in a locked position. When energized one port opens to pressure and the other to exhaust. In open-center Model 1013 both cylinder ports are open to exhaust and pressure is blocked when solenoids



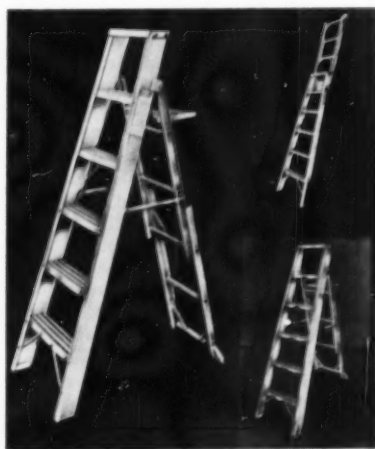
are deenergized, leaving the cylinder rod in a free state. When energized one port opens to line pressure and the other remains open to exhaust. Both are stocked in $\frac{3}{8}$ -inch pipe size. Side porting is standard, but valves with bottom ports are supplied upon request.

Circle 14E on reply card

If you have a house with a shingled roof you might want to "batten down" against winds of hurricane force. However, instead of nailing down battens, you can do this, we are told, by using Wind Seal Cement, which comes packed in a cartridge that fits any standard caulking gun. Each contains enough of the adhesive compound to anchor the tabs of a square of shingles, which is equivalent to 100 square feet. All that is required is to put a spot of cement under each shingle and press it down tight.

Circle 15E on reply card

Adjustability characterizes a new magnesium stepladder marketed by Abbeon Supply Company. A conventional stepladder, it has a rungged back section that can be shortened to give the ladder a firm support on uneven levels such as stairs. Or the back legs can be raised and locked to form an extension ladder. Of sturdy construction and light weight, it has a bucket rack and serrated hard-rubber feet to prevent slipping. There are five sizes ranging from 6 to 10 feet; height when extended, 10 to 18 feet.



Circle 16E on reply card

SHORT CUT To Speed Construction

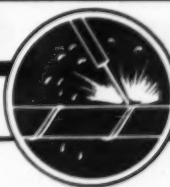


One of the big advantages of Naylor Spiralweld pipe and one-piece Naylor Wedge-Lock couplings is the speed with which lines can be made up in dredging operations and for handling air and water on construction jobs.

This pipe and coupling combination gives you lines that can be installed easier and faster than by any other method. A hammer is the only tool needed to assemble or disassemble connections. In tunnel work, lines hug the wall and space is saved as they can be made up with only one side of the pipe in the open. In addition to faster installation, there is the factor of high salvage and re-use value to consider.

For the complete story, ask for Bulletins No. 507 and No. 513.

NAYLOR PIPE



NAYLOR PIPE COMPANY

1245 East 92nd Street
Chicago 19, Illinois

Eastern U. S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Circle 21A on reply card

When materials hang-up

Profits go down!

How much is down-time, due to material hang-up in bins, costing you?

If you have a problem of material flow from your bins, your entire production line is bound to suffer.

PneuBin can solve your problem!




- Safe
- Economical
- Quiet

PneuBin panels are a new concept in bin-stored material activation. The PneuBin panel is a steel-backed, Neoprene diaphragm mounted on the inside walls of your present bins. This PneuBin panel, operating off your regular plant air supply is inflated and deflated in cycles, positively displacing the bin contents to activation. This positive displacement assures constant free flow of materials . . . eliminates bridging, funneling and caking.

PneuBin engineers will gladly make no-obligation recommendations on your specific material handling problems. Write for FREE literature and "Flow Stoppage Report."

GEROTOR

MAY CORPORATION

MANUFACTURERS OF—		1531 MARYLAND AVENUE, BALTIMORE 3, MARYLAND	
	Hydraulic Pumps and Motors		Variable Speed Hydraulic Transmissions
		PneuBin—Pneumatic Bin Evacuators	

BRIEFS

Girls, what color typewriter would you like to have—desert sage, lime light, mist green, honey beige, white sand or gray? You can have your choice if you are getting a 1956 Standard Remington. And that's not all. You yourself can change any or all the characters in a matter of minutes because the type is removable and interchangeable.

More efficient electrical equipment is promised as the result of a new insulating enamel for copper wire produced by Westinghouse research engineers. It is a modified polyester-type resin containing about 20 percent silicone. Endurance tests of motors incorporating it indicate that they can be operated for ten years at a temperature of 325°F.

It seems incredible, but it is reported that the weight of a big aircraft carrier has been reduced an estimated 30-40 tons simply because a "stuffing tube" was made of Zytel—a nylon resin—instead of metal. The fitting is used to form a watertight seal at a point where an electrical cable enters a terminal box.

Toy automobiles and trucks, model planes, etc., are being equipped with a diesel engine that develops 1/4 hp at 11,000 rpm. Named Webra, it is being built in West Germany and weighs only 3.2 ounces, exclusive of the fuel tank.

A blowout-proof pneumatic tire for buses and trucks that will outlast the vehicles is now in production. Its makers claim that it will hold up for 300,000 miles, and forthcoming improvements are expected to raise that figure to 500,000. Its longevity is ascribed to the use of steel-wire reinforcing.

Some years ago Donald Heagney, of Yonkers, N.Y., worked for a contractor who was engaged to make a tunnel leading out of Sing Sing escape-proof. Recently Heagney was committed to the prison to begin a 25-year sentence. But the authorities there decided that he knew too much about the place and, just to be on the safe side, had him transferred to Attica prison.

When you buy a \$2000 automobile you pay approximately \$479 in taxes, according to the American Automobile Association. The exact amount varies in the different states. The biggest slices are \$114 on materials and parts and their transportation, \$146 federal excise, \$110 federal income and other taxes paid by the manufacturer.

Books and Industrial Literature

The American Council of Independent Laboratories, Inc., has released its 1956 directory. In addition to giving detailed information about each of its 67 members, the new edition includes an index of services and facilities covering more than 400 categories. The member laboratories which specialize in or are qualified to do research in each classification are identified by code numbers and listed geographically. Send requests for copies on company letterheads to H.M. Dudley, The American Council of Independent Laboratories, Inc., 4302 East-West Highway, Washington 14, D.C.

Magnesium Alloy Research Studies is a 138-page report on the constitution of alloys in the magnesium-lithium-aluminum and the magnesium-lithium-zinc alloy systems, on the development of magnesium with a low-alloy content for high-ductility sheet material and on the investigation of single crystals of magnesium alloys. It was prepared for the U.S. Air Force by members of the Rensselaer Polytechnic Institute and has been released to industry. Report PB 111762 is obtainable from the Office of Technical Services, Department of Commerce, Washington 25, D.C. Price \$3.50.

Practical shop data and up-to-date developments in the art of brazing aluminum are presented in a new book obtainable by writing on company letterhead to Aluminum Company of America, 774 Alcoa Building, Pittsburgh 19, Pa. It answers most routine questions concerning brazing materials and methods; explains the action that occurs between the filler metal, parent metal and the flux during the process; and discusses the designing, preparing and assembling of brazed joints. Of 134 pages, it contains much other information of value to engineers, designers and shopmen.

A revised edition of *The Design and Application of Mechanical Leather Packing* has been published by the National Industrial Leather Association. Written and edited by leading manufacturers in the field, the book should prove of value to engineers and users of air and hydraulic cylinders and presses because it enters both into basic packing design and discusses installation, operating and maintenance practices. It is available through the courtesy of J. E. Rhoads & Sons, a member of the association.



"Here's 8 cents, I'm withholding 2."

APRIL, 1956

CONTINENTALS GIVE YOU ALL THE THINGS that add up to DEPENDABLE POWER



QUALITY assured by more than 50 years' experience in specialized internal combustion power.



ENGINEERING with each specific application in mind.



SPECIALIZATION that does away with hit-or-miss matching to the job.



PARTS INTERCHANGEABILITY for quick replacement, with minimum down-time.



AUTHORIZED SERVICE and genuine Red Seal parts available from coast to coast.

By standardizing on Continental Red Seal engines, you get **ALL THE THINGS** that add up to dependable power. There's a Red Seal model engineered and built for almost every application in transportation and industry, as well as on the farm. Overhead-valve and L-head models for use with all standard fuels are available as bare engines or as power units, open or closed. Bulletins and full information on request.

**SERVICE
AND GENUINE RED SEAL PARTS
SOLD EVERYWHERE**

IN ADDITION TO ITS LARGE ENGINES, Continental builds an outstanding line of heavy-duty air-cooled four-cycle models for industrial and farm applications requiring 2 to 3 h.p. Advanced engineering gives them easy starting, high dependability, and unusual lugging capacity at low speeds . . . Options: patented and exclusive Contex® external ignition system, low-level ignition cut-off, 6-1 reduction gear, and other features. Available also for use on kerosene . . . For information on these models, address Air-Cooled Industrial Engine Division, 12800 Karchoval Ave., Detroit 15, Michigan.

AD SERIES
VERTICAL SHAFT



Continental Motors Corporation

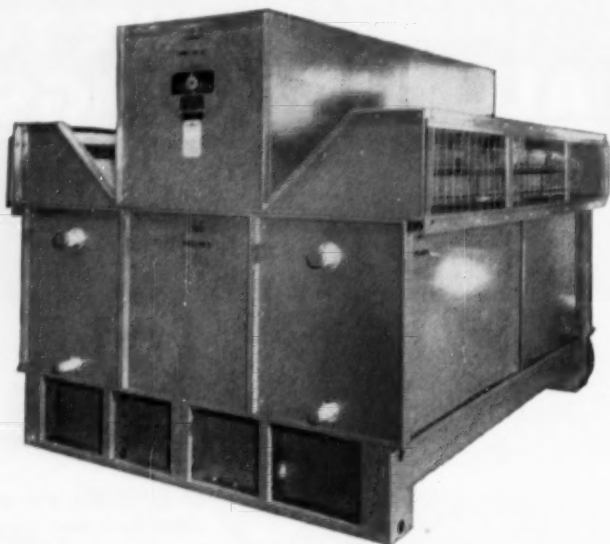
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6 EAST 45TH ST., NEW YORK 17, NEW YORK • 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF.
6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 910 S. BOSTON ST., ROOM 1008, TULSA, OKLA.
1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

Circle 234 on reply card

(127)

Adv. 26



NIAGARA SECTIONAL Aero HEAT EXCHANGER

*gives close temperature control,
saves you **LABOR**, Power, Water*

- Because the new design improves the heat transfer to the out-door air by evaporation.
- Because new features keep your equipment working for long life with "new plant" efficiency...always full capacity.
- Because you save 95% of cooling water cost.

You get faster, more accurate cooling of industrial fluids to specified temperatures.

You improve your quality of production by removing heat at the rate of input.

You save labor in upkeep. With full access to all interior parts and piping you see everything in easy inspections. You head off dirt accumulation and corrosion. Casing panels are removable without moving the coils. The coils can be cleaned from both sides.

First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 7,000,000 to 18,000,000 Btu/hr. No other heat exchange method gives you so much saving in money and convenience.

Write for Niagara Bulletin 132. Ask for the full story of how you can save expense in your plant and improve your product's quality.

NIAGARA BLOWER COMPANY

Dept. CA, 405 Lexington Avenue
NEW YORK 17, N. Y.

District Engineers in Principal Cities



Over 40 Years' Service in Industrial Air Engineering

Circle 24A on reply card

upon written request on company letterhead to the firm at 2100 W. Eleventh Street, Wilmington 99, Del.

Charts, graphs, sketches and photographic illustrations are used by Lukens Steel Company to describe its new "T-1" steel, a high-strength, easily welded alloy available in thicknesses from $\frac{3}{16}$ inch to 6 inches and in standard widths up to and including 195 inches (maximum length 12 feet).

Circle 17E on reply card

As a help to design engineers and users of lubrication pumps, Tuthill Pump Company is offering a new catalogue, No. 108, covering its line of cartridge-type units ranging in capacity from 55 to 170 gph. There are two models for nondirectional service and two with automatic reversing features.

Circle 18E on reply card

Bulletin 401 announced by the Kinney Manufacturing Division of The New York Air Brake Company contains descriptions, engineering drawings, cutaway views and general dimension charts of its line of bronze, cast-iron and fabricated-steel vacuum valves of the bellows type.

Circle 19E on reply card

Bulletin 7040 offered by Minneapolis-Honeywell Regulator Company, Wayne and Windrim Avenues, Philadelphia 44, Pa., deals with its new small-case indicating pressure controller available in a range from 0-50 to 0-200 psi with on-off or 10 percent Throttlor control.

Catalogue No. 950-1 released by The Thomas Laughlin Division of American Hoist & Derrick Company deals with its complete line of fittings for wire rope and chain. Of 28 pages, it illustrates each product, describes its safety features and gives engineering data.

Circle 20E on reply card

Rotary instrument and control switches are the subject of an 8-page bulletin released by Allis-Chalmers Manufacturing Company. Their features and operation are discussed, and installations on vertical and bench-type control boards are shown. Flexibility is achieved by mounting each pair of stationary contacts on individually molded Bakelite-base blocks—a type of construction that permits adding stages to existing switches.

Circle 21E on reply card

Reduce Speed is the title of a bulletin (E-2408) being distributed by the Reliance Electric & Engineering Company and describing its latest line of gearmotors which is said to be the first incorporating new NEMA motors and completely redesigned gearheads. A 2-page cutaway view points out the features of the unit, which is available in varying types, mountings, enclosures and ratios for a wide range of applications.

Circle 22E on reply card

In a new 3-color picture book entitled *Compressors for the Process Industries* Ingersoll Rand Company shows its complete line of centrifugal and reciprocating units driven by steam, gas, diesel or electric power in such varied operations as repressuring oil wells, refining, and manufacturing chemicals and ammonia, plastics and antibiotics. The machines are designed for pressures ranging from deep vacuum to 35,000 psi, for capacities up to 165,000 cfm and for handling air and a variety of other gases.

Circle 23E on reply card

A comprehensive catalogue on Carboloy cemented carbides for the metal-working industry has been announced by the Carboloy Department of General Electric Com-

pany. Of 66 pages, it deals with such topics as the most effective cutting speeds for carbide tools; machine-tool horsepower requirements and how to determine the shank size of single-point tools; contains a carbide grade-selection guide; and gives information on its machinability computer and about its customer training courses on carbide tools and dies.

Circle 24E on reply card

Information on both air and hydraulic cylinders and their components such as valves and mountings, as well as on standard and custom-built power units, is contained in a bulletin published by Rivett Lathe & Grinder, Inc.

Circle 25E on reply card

A revised bulletin—No. 1025B—is available from Sarco Company, Inc., on its LSI electric indicating temperature controller. It contains a simplified sketch that shows how the instrument can be used to provide sequence control combinations such as step-heating, heating and cooling, wide differential control, and temperature control plus operation of signal devices.

Circle 26E on reply card

General Electric's complete line of control and transfer switches for low voltage applications up to 600 alternating or direct current is covered in a 28-page illustrated bulletin, GEA-4746B. In addition to describing their special features it contains application data and representative contact diagrams.

Circle 27E on reply card

The Garlock Packing Company, which has been closely associated with the development of silicone rubber as a sealing material, has published a bulletin—AD 147—that deals with its features, describes the various products, including silicone sponge rubber in the form of sheets and extruded shapes, and lists their applications.

Circle 28E on reply card

Modern Panelboards is the self-explanatory title of a 75-page catalogue, No. 3-205, published by Federal Pacific Electric Company. In addition to photographic illustrations, drawings and diagrams to show their features and construction, the brochure includes 20 pages of engineering data pertinent to selection and installation; transformer connections for distribution voltages; National Electrical Code and Underwriters Laboratories requirements; and circuit breaker characteristics.

Circle 29E on reply card



"I've no experience—could I begin on a low bridge?"

HORSEPOWER

MEANS MORE TO THE

PLANTS INSTALLING

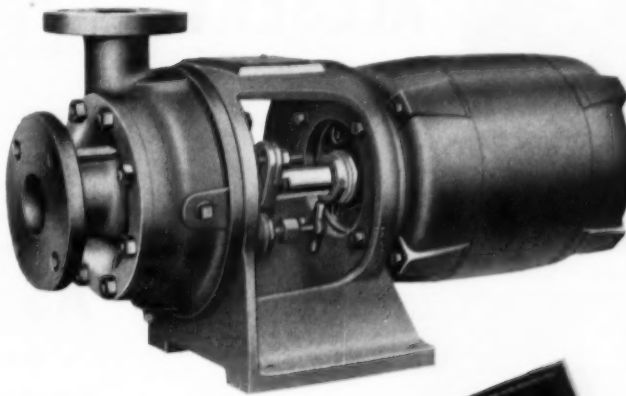
INGERSOLL-RAND

MOTOR PUMPS

It's a fact that the efficient I-R construction often enables you to use a smaller Motorpump to do the work usually demanded of pumps of greater horsepower!

So, I-R Motorpumps reduce your costs in several ways. First of all, in original cost. Save weight and space, too. Deliver more gallons-per-minute per horsepower used . . . and cut maintenance costs as well, because Motorpumps are built for longer, trouble-free service!

If you're not familiar with the famous I-R Motor-pump line you'll do well to get full details right away.



The latest catalog gives complete data needed to choose a Motor-pump . . . from 1/4 to 75 hp, capacities 5 to 2800 gpm, heads to 650 ft. Write to:



Ingersoll-Rand

9-366 11 Broadway, New York 4, N. Y.

Circle 25A on reply card

*These Two Will Fill
EVERY AIR HOSE JOB
... With Unequalled
Reliability, Economy*

"SUBWAY"



For Rock Drills and Other
Heavy-Duty Air Tools...

"Subway" ... a Goodall "Standard of Quality" product ... is built to assure uninterrupted delivery of maximum air power to the drills, even when the "going" is roughest. Light weight, flexible, easy to handle. Specifications include oilproof tube; highest quality wrapped duck carcass; wear- and weather-resistant red rubber cover, with new criss-cross yellow stripe for positive identification. Sizes $1\frac{1}{2}$ " to $1\frac{3}{4}$ ", I. D., in maximum lengths of 50 feet.



"ALLSERV"

General Purpose
HOSE

For All Types of Pneumatic Tools—Also Water, Oil, etc.

"ALLSERV" will not only give long, reliable service on air and pneumatic tools, but will prove equally efficient in the handling of water, oil, gasoline, chemicals, paint spray, etc. It is a very flexible all-"Synplastic" (R) molded-and-braided hose, in one, two or three braid construction, with a tough wear-resistant red cover. Made in $1\frac{1}{4}$ " to $1\frac{3}{4}$ ", for working pressures from 200 lbs. to 300 lbs.

Contact our nearest branch for details

"If it's GOODALL, it MUST be Good!"

Standard of Quality—Since 1870



HOSE • BELTING • FOOTWEAR • CLOTHING
AND OTHER INDUSTRIAL RUBBER PRODUCTS

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GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.
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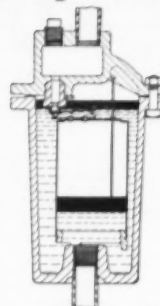
Circle 26A on reply card

Adv. 29

THIS AIR TRAP is not stopped by oil

NOW you can get dependable, automatic drainage of water from compressed air intercoolers, aftercoolers, receivers and separators even though the compressor is pumping heavy oil. Any oil reaching Armstrong Inverted Bucket Air Traps collects at the top and is discharged ahead of the water.

Armstrong Air Traps have a simple, proven design; there's nothing to stick, bind or clog. Stainless steel mechanism resists corrosion. For pressures to 600 lbs. *Guaranteed to Satisfy.*



Inverted Bucket Air Traps.

Side-inlet side-outlet styles available.



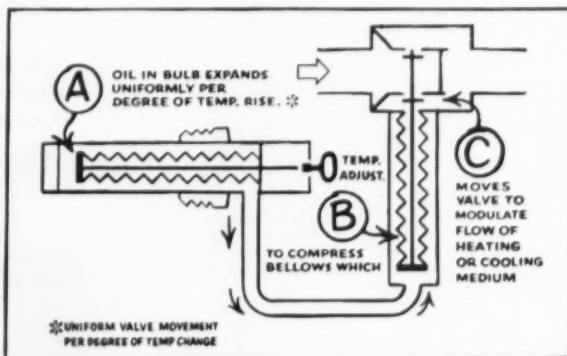
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885 Maple Street • Three Rivers, Michigan

SEND FOR FREE BULLETIN No. 2022
GIVING DETAILS



Manufacturers of the well known ARMSTRONG STEAM TRAP

Circle 27A on reply card



Automatic Self-powered Temperature Control

AS SIMPLE AS A-B-C!

$\frac{1}{2}$ " size—only about \$100

A simple thermostat—a length of tubing—a valve. That's all! That's the trouble-free design of the Sarco SELF-POWERED temperature control.

1. Simple, inexpensive, dependable, effective.
2. No gadgets that take a technician to read and repair!
3. Self-contained—no exposed mechanism. Packless valve.
4. Self-powered—no com-

pressed air or electricity needed.

5. Not affected by cross-ambient temperatures or elevation of the bulb.

6. Thousands give accurate service ... for firms such as Colgate - Palmolive Co., Sinclair Refining Co., Swift & Co.

Write for Bulletin 620 to Sarco Company, Inc., Empire State Bldg., New York 1, N.Y.

SARCO

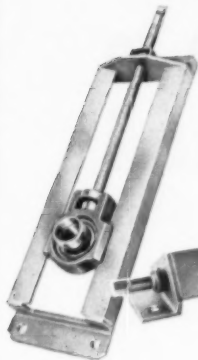
8164P

Circle 28A on reply card

COMPRESSED AIR MAGAZINE

new...

**pre-lubricated
take-up bearings**



Style "T"



Style "P"

**SLASH
maintenance costs**

Pre-Lubricated At Our Factory For Life • Seals Lubricant In—Dirt Out • Standard Series Ball Bearings • Self-Aligning • Frames of Welded Structural Steel • Can be Operated in Tension or Compression



T. B. WOOD'S SONS COMPANY

CHAMBERSBURG, PA.

Cambridge, Mass.

Newark, N. J.

Dallas, Texas

Cleveland, O.

Circle 29A on reply card

**NO MOISTURE
OR DIRT
GETS BY HERE**

**Johnson
Self-Draining
Compressed Air
Separator.....**

Like all Johnson Separators the new Type "SA" Self-Draining Separator combines the two most effective principles of removing moisture and dirt from compressed air:

1. Controlled expansion of air in separator precipitates most of the moisture.
2. A "thousand baffles" of coarse mesh repeatedly changes flow of direction to capture remaining foreign matter.

Self-Draining—a simple but complete trap mechanism built right in, automatically drains separator whenever necessary.

WRITE FOR CATALOG

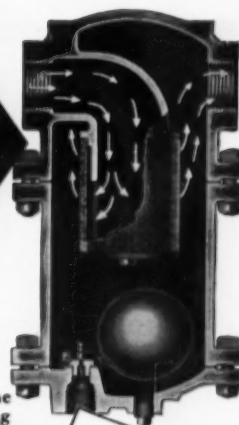
The Johnson Corporation

830 WOOD STREET



THREE RIVERS, MICH.

Circle 30A on reply card



Johnson Separation Devices include Separators for Compressed Air or Steam. After coolers, oil absorbers.

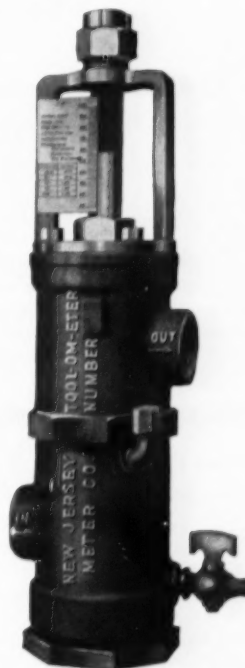
THE TOOL-OM-ETER

Compressed Air Meter shows direct on a scale, in cubic feet of free air per minute, the flow of air in a pipe or hose. These meters will show the air consumption of any pneumatic tool, rock drill, air motor, sand blast, air-lift, or other application of compressed air.

They are also used for maintaining air equipment in most effective working condition. You can get the facts about your use of compressed air, and these facts will enable you to bring your costs and production under profitable control. Write for new Bulletin A-8.

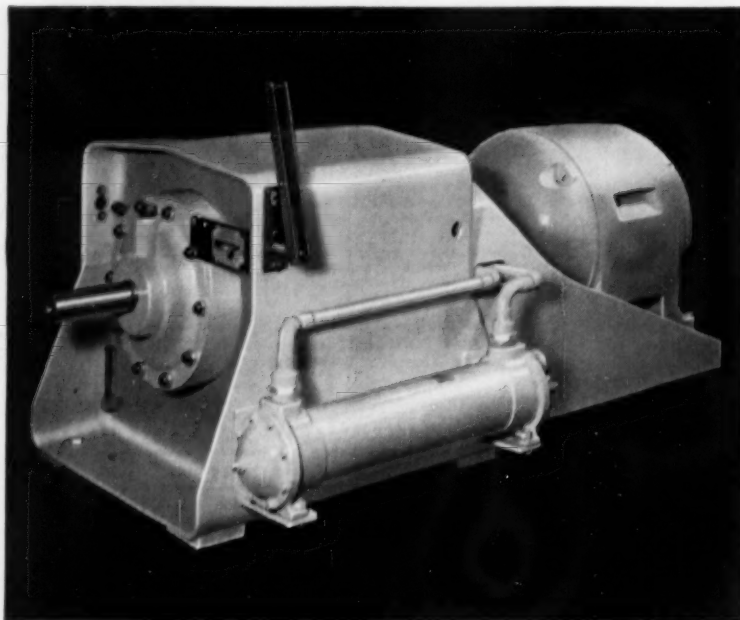
WE SPECIALIZE in compressed air devices, including the "DriAir" Separator for automatically removing the water from compressed air lines. Ask for Bulletin DA.

New Jersey Meter Co.
Plainfield, N. J.



Circle 31A on reply card

Gýrol Fluid Drives limit torque to give you a built-in safety factor!



Type VS, Class 2 Gýrol Fluid Drive is available in ten sizes, 1 hp to 800 hp, speeds to 3600 rpm.

The American Blower Type VS, Class 2 Gýrol Fluid Drive not only offers adjustable, stepless speed control, but its inherent shock-absorption ability protects machinery.

For, a Gýrol Fluid Drive will limit the amount of torque which can be transmitted under overload conditions. This torque-limiting capacity can be adjusted by merely positioning the speed-control lever.

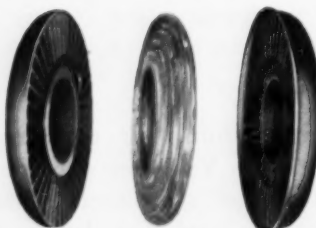
What's more, Fluid Drive permits the motor to come up to speed under almost no-load conditions—allowing simplification of motors and starting equipment for heavy starting loads.

You'll discover many more important benefits for a wide variety of industrial applications by calling our nearest branch.

FEATURES

- Can be reversed while in motion by reversing motor
- Across-the-line starting on many applications
- Motor can reach full speed before engaging load
- A compact, self-contained unit
- Trigger-action response—adjustable speed
- Speed may be controlled manually or automatically

Simple design, flexible operation



Runner Vortex of Oil Impeller

Gýrol Fluid Drive provides a simplicity of design and a flexibility of operation no other method of power transmission offers—plus an inherent safety factor. Operates on hydro-kinetic principle, using vortex of oil to transmit power from driving to driven machinery. Power is transmitted smoothly, evenly, efficiently, without shock.

American Blower products serve industry

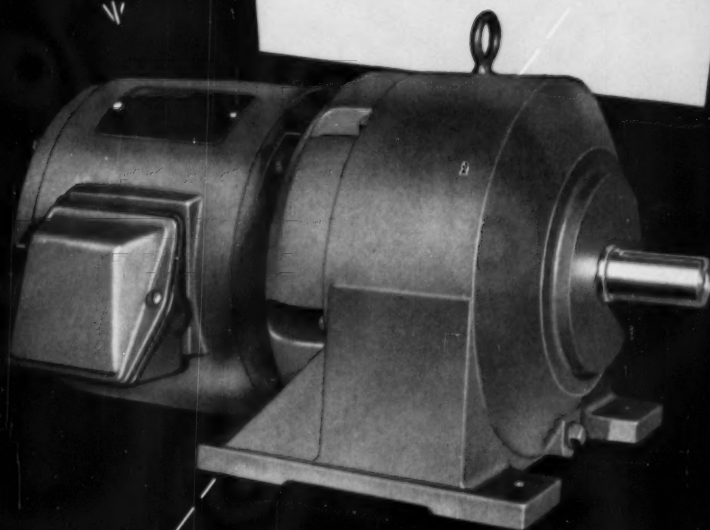
- AIR CONDITIONING, HEATING, VENTILATING EQUIPMENT
- MECHANICAL DRAFT EQUIPMENT
- INDUSTRIAL FANS AND BLOWERS
- CENTRIFUGAL COMPRESSORS
- GÝROL FLUID DRIVES
- DUST COLLECTORS
- REFRIGERATING MACHINES

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

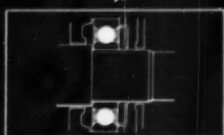
Division of AMERICAN-Standard

AMERICAN  **BLOWER**

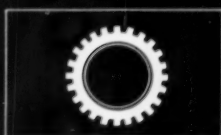
Don't overlook what you can't see



You can't always see what makes a gearmotor outstanding. It's the attention paid to small design details that makes the difference. Here are a few of the details that make the new Reliance Gearmotor stand above the rest.



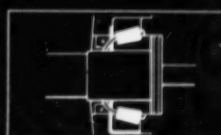
FOOLPROOF METERMATIC motor bearing lubrication and oil bath gear lubrication for long-life protection against wear.



INDUCTION HARDENING of the tough alloy steel gears gives a perfect combination of wear resistance and strength.



SIMPLIFIED GEARING with few moving parts reduces friction losses and lessens chances of break-down.



THRUST BEARINGS handle heavy overhung loads safely by placing strain on the frame instead of the shafts.

**REDUCE
SPEED**

Find out the complete story for yourself—contact your Reliance representative or write for Bulletin E-2408.

E-1559

RELIANCE ELECTRIC AND
ENGINEERING CO.

CLEVELAND 10, OHIO • OFFICES IN PRINCIPAL CITIES

Canadian Division: Welland, Ontario



IMPOSSIBLE WITHOUT EXPLOSIVES

The modern highway—wide and spacious with increased visibility and no cross traffic—is a tribute to modern construction techniques. The above section of U.S. 99 between Bakersfield and Los Angeles, California, is a good example of engineering know-how. Where rock was encountered, blasting crews with Hercules explosives took over.

For more than forty years, Hercules has engaged

in continuous research into the development of explosives materials and improved blasting techniques. Whether your requirements are for construction, mining, quarrying, seismic prospecting, or in other fields where explosives are needed, Hercules technical representatives will be glad to assist in the selection of the right materials for the most efficient job.

HERCULES POWDER COMPANY

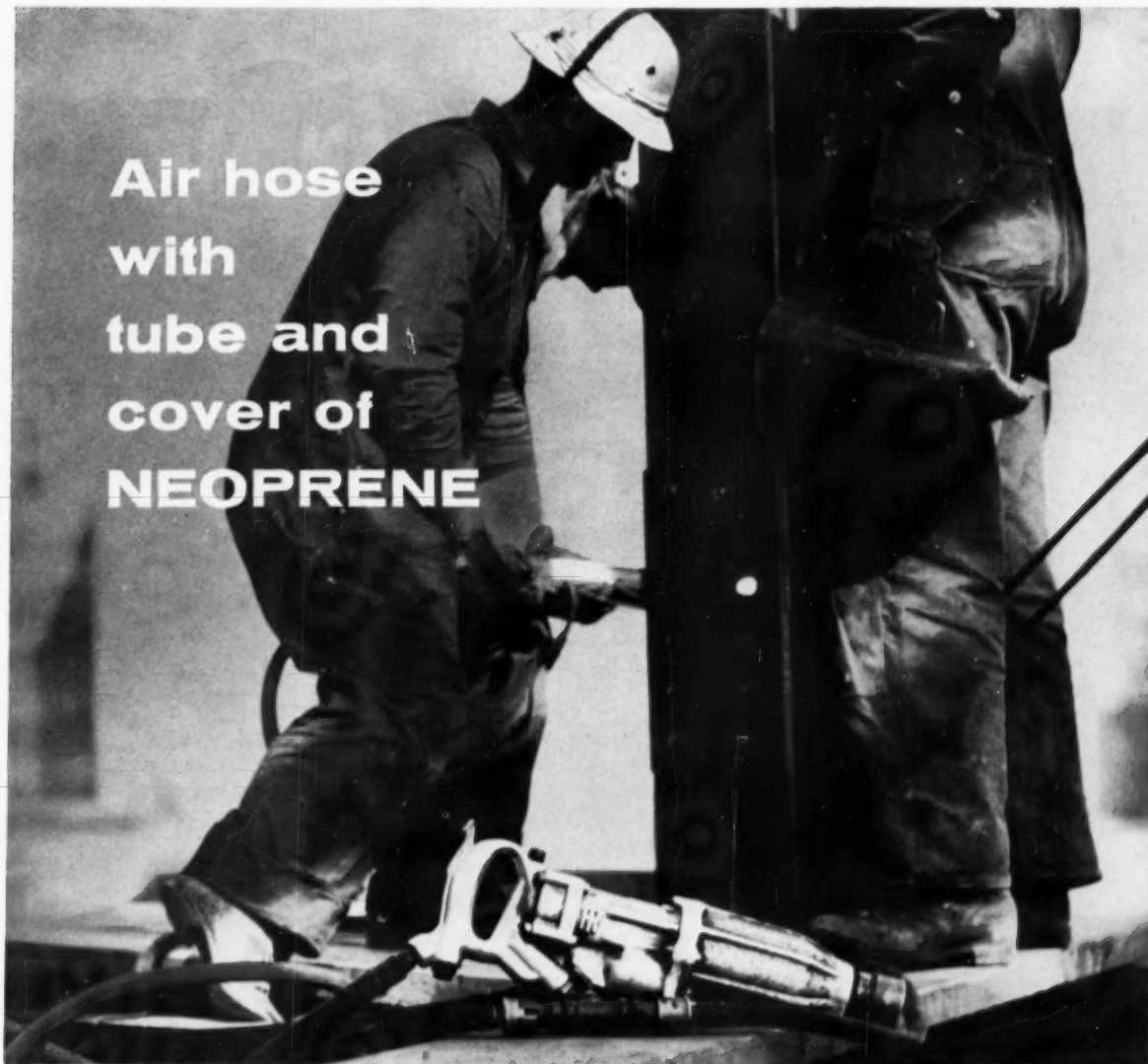
Explosives Department, 932 King Street, Wilmington 99, Del.

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Calif.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Calif.



AR56-2

Air hose with tube and cover of NEOPRENE



Twisting, scuffing, oil and sun have little effect on this hose

Way up in dependability, way down in replacement costs—that's the story of hose made of Du Pont neoprene.

Neoprene tubes are flexible, resist the attack of oil in the line. As a result, they stay smooth, won't crumble and clog vital tool parts.

Covers of neoprene protect the fabric of the hose when it is dragged and twisted over sharp and abrasive objects. The neoprene covers give lasting protection because neoprene resists the deteriorating effects of oil and grease, sunlight and weather.

This double-duty protection, inside and out, is the reason why neoprene cover and tube are used as original equipment on most compressed air hose. The next time you order hose, be sure to specify Du Pont neoprene for extra-long service life.

FREE! The Neoprene Notebook

Each issue brings you new, unusual applications of neoprene . . . new products . . . interesting articles.

E. I. du Pont de Nemours & Co. (Inc.)
Elastomers Division, CA-4
Wilmington 98, Delaware

Please add my name to the mailing list of the NEOPRENE NOTEBOOK.

Name _____ Position _____

Firm _____

Address _____

City _____ State _____



NEOPRENE

The rubber made by Du Pont since 1932



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

APRIL, 1956

Circle 34A on reply card

Circle 35A on reply card

Adv. 34

CYCOILS take the DUST, leave only CLEAN AIR



Gulf Oil Corporation, at its Odessa, Texas, Sand Hills Plant, depends on AAF Cycoils to keep tough West Texas dust out of its valuable engines.

THIRTEEN big Ingersoll-Rand gas-engine compressors represent a big investment in fine equipment. They deserve the finest protection. And, when they're at work in oil refining, the stakes become substantially higher.

That's why you see that battery of 22 AAF Cycoils protecting the engine air intakes at the Odessa, Texas, Sand Hills Plant of Gulf Oil.

AAF Cycoil heavy-duty oil bath air cleaners provide 4-way cleaning: impingement, scrubbing, cy-

clonic action and filtering. Over 90% of the fine dust content in the air is trapped in oil and removed by centrifugal action before most of it even reaches the filter pads. Additional filtering pad action provides air that's virtually 100% *dust-free*.

Only Cycoil gives engines and compressors such remarkable protection. Write for Bulletin No. 130. It's the story of Cycoil Oil Bath Air Filter. And it's jam-packed with the kind of facts that save trouble . . . and money.



American Air Filter

COMPANY, INC.

402 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Type CMS
Multi-Duty Filters



Type G Pipeline
Air Filters



— BETTER AIR IS OUR BUSINESS —

Type OCH
Intake Air Filters



Cycoil Oil Bath
Air Filters



WHY MARATHON ?



• EXPERIENCE OF PROVEN PERFORMANCE . . . OVER HALF A CENTURY

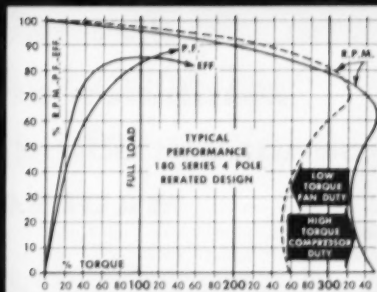
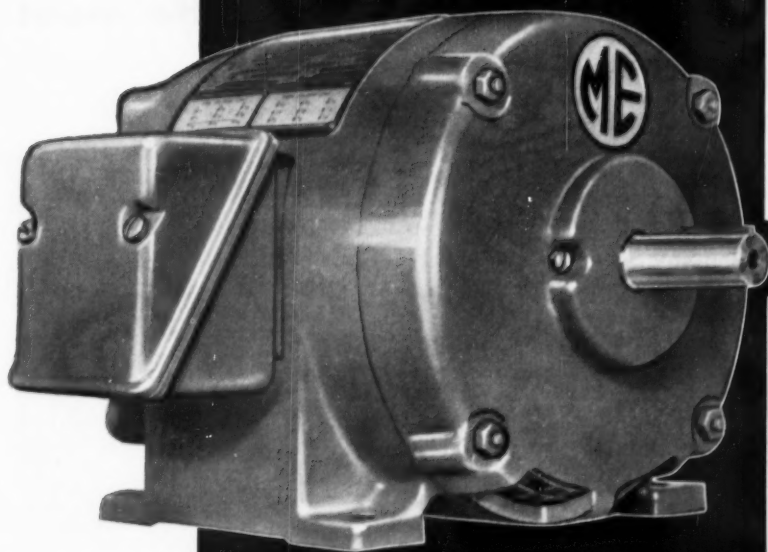
There is no substitute for the reliability of proven performance. Top names of the Nation's Industry have proven performance in ENGINEERING . . . DESIGNING . . . PRODUCING QUALITY PRODUCTS.

• VERSATILITY WITH A WIDE RANGE OF DESIGN

MOTORS 1/20 thru 2500 HP . . . GENERATORS 1/2 thru 2000 KW . . . Single Phase, Polyphase, Direct Current . . . Standard or Special . . . Marathon Electric can design to meet your special specifications.

• SERVICE THROUGHOUT THE NATION

MARATHON ELECTRIC has a DISTRICT OFFICE or Representative near you. Call your ME Representative TODAY to help solve your motor problem.



MARATHON RERATED NEMA FRAMES provide 4 in 1 PROTECTION

DRIP PROOF
SPLASHPROOF

WEATHER PROTECTED
GUARDED

MARATHON ELECTRIC'S new rerated NEMA frame design packs all these requirements into a single unit . . . Available in standard ratings for high torque-compressor duty or low torque-fan duty, or made to your specifications.

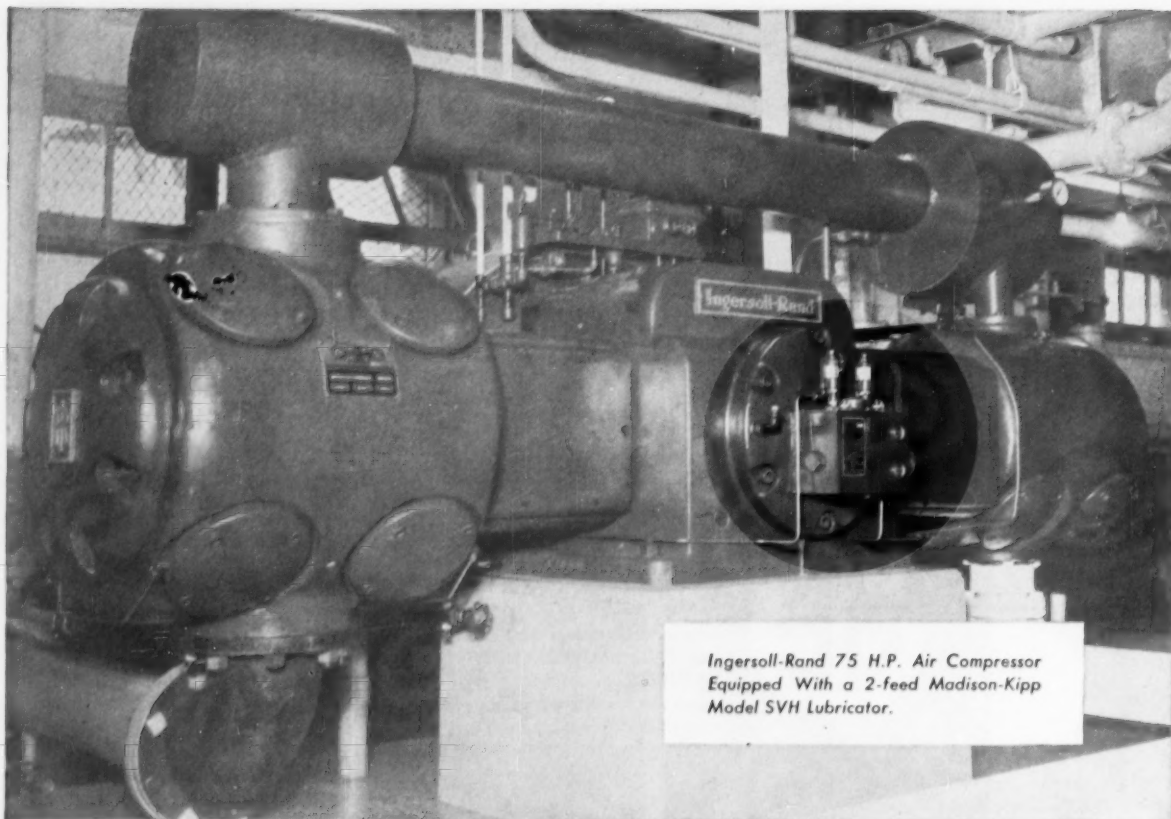
Write or Wire
SPADE 51
for further
Information

MARATHON
HOME OFFICE AND FACTORY, WAUSAU, WIS.



ELECTRIC
FACTORIES AT ERIE, PA. AND EARLVILLE, ILL.

SALES OFFICES IN PRINCIPAL CITIES



Ingersoll-Rand 75 H.P. Air Compressor
Equipped With a 2-feed Madison-Kipp
Model SVH Lubricator.

**Machines of great performance use the most
dependable oiling system ever developed**

MADISON-KIPP

Fresh Oil ... by the measured drop,

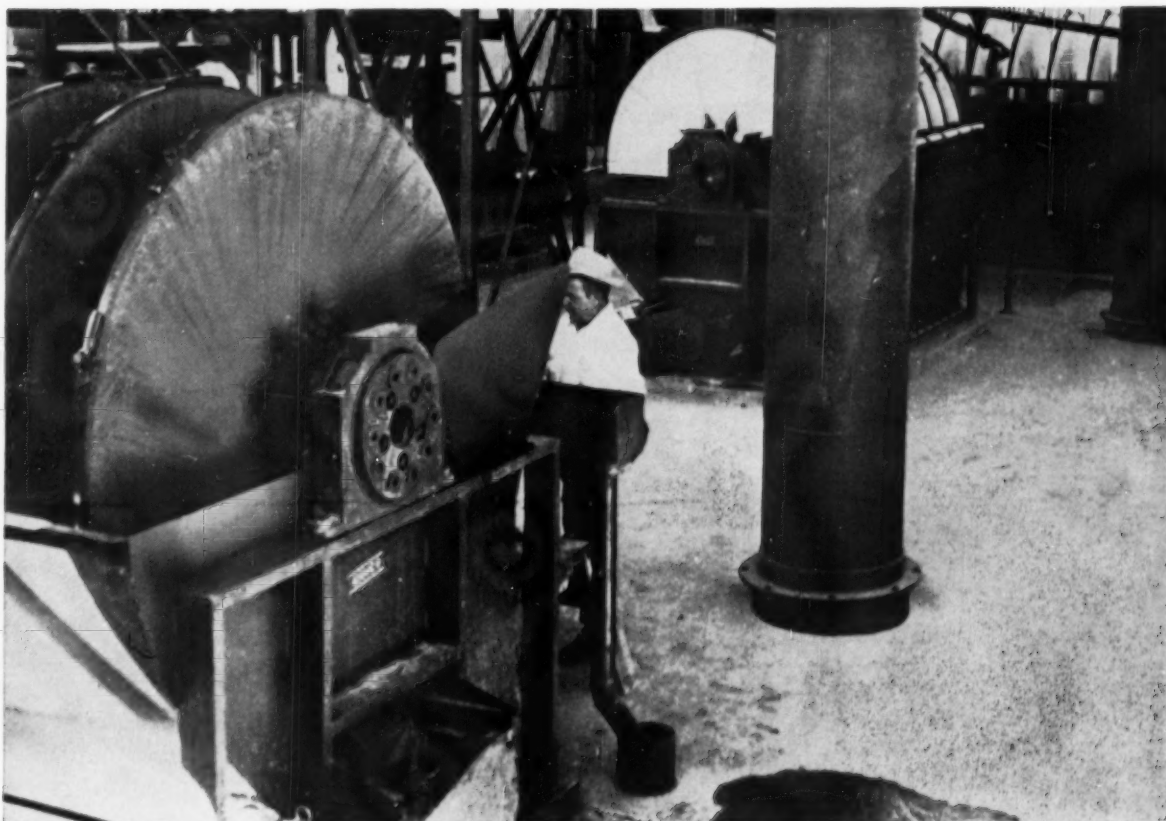
from a Madison-Kipp Lubricator is the most dependable method of
lubrication ever developed. It is applied as original
equipment on America's finest machine tools, work engines
and compressors. You will definitely increase your
production potential for years to come by specifying
Madison-Kipp on all new machines you buy, where oil under
pressure fed drop by drop can be installed. There are
6 models to meet almost every installation requirement.



kipp

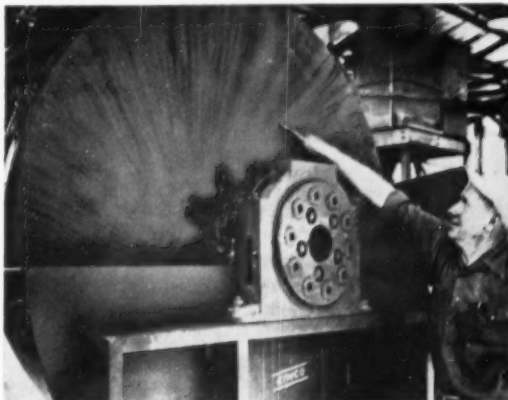
MADISON-KIPP CORPORATION
202 WAUBESA STREET • MADISON 10, WIS., U. S. A.

- Skilled in Die Casting Mechanics
- Experienced in Lubrication Engineering
- Originators of Really High Speed Air Tools



EIMCO AGIDISCS REDUCE MOISTURE IN COPPER CONCENTRATE

Uniformity of cake formation produces higher tonnages
at lower moisture



Recent installations of Eimco Agidisc Filters show the superiority of this equipment in dewatering metallurgical concentrates.

One installation on a copper concentrate with an 80% minus 326 mesh feed has been dewatered to a moisture content of approximately 12%. This installation will produce approximately 260 lbs. per square foot per hour when it is in full operation.

The Agidisc provides a smooth, evenly distributed cake on the sectors. The cake moistures are even over the surface of the disc because the particle sizes are evenly distributed. On the Agidisc you completely eliminate (1) thin feathered edges of cakes near the sector bell, (2) heavy, soggy classification rings near the periphery of the sector. (3) Classified materials in special belts around the sectors as per particle size, (4) scrubbing media in or through channels cut in fast settling slurry deposits in the bottom of the filter tank.

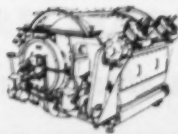
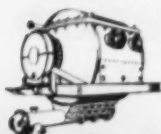
Only Eimco makes the Agidisc — Investigate the extra values of using this filter on your dewatering problems.

THE EIMCO CORPORATION
Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

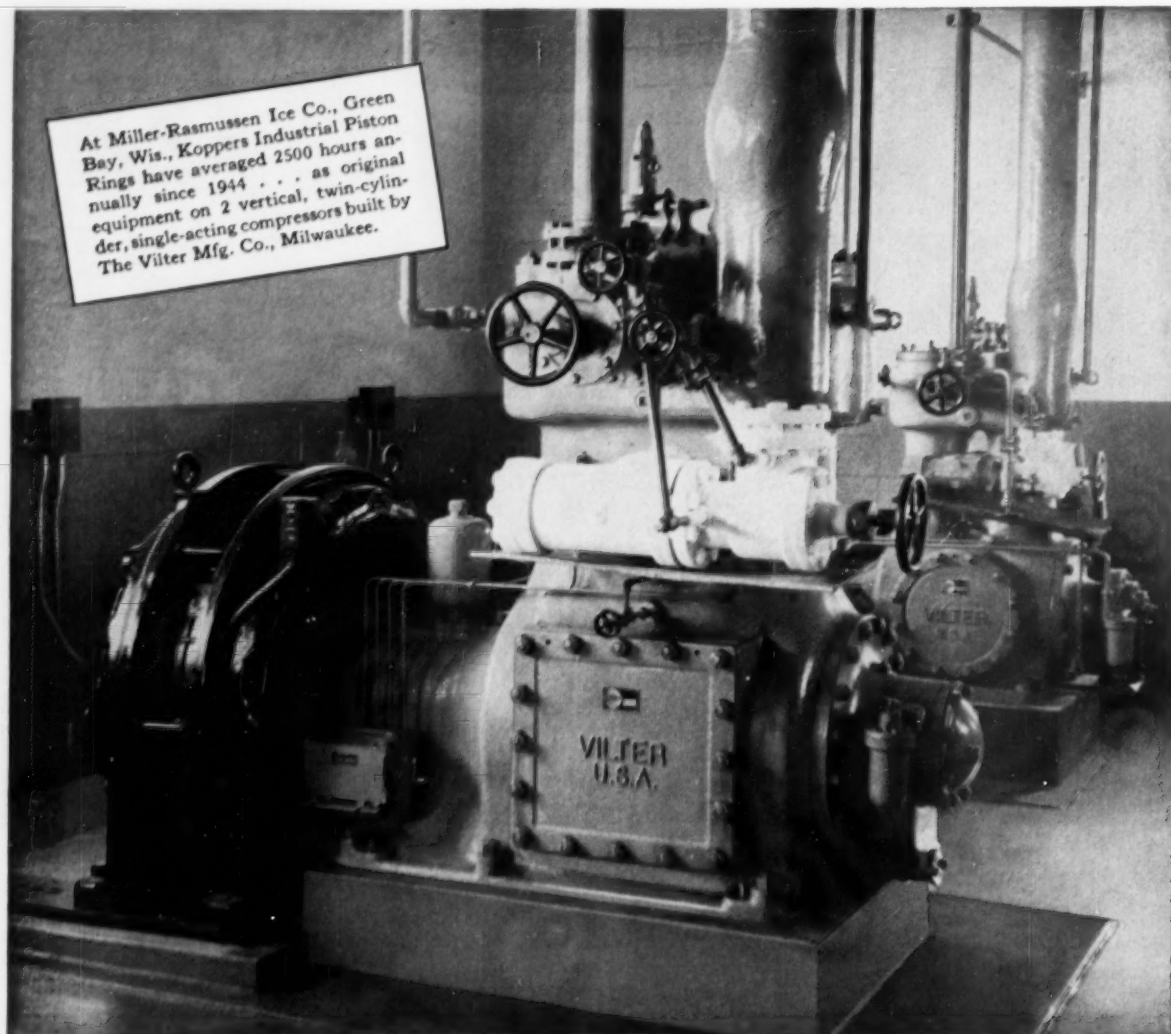
New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kallogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash.
Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa



8-105



At Miller-Rasmussen Ice Co., Green Bay, Wis., Koppers Industrial Piston Rings have averaged 2500 hours annually since 1944 . . . as original equipment on 2 vertical, twin-cylinder, single-acting compressors built by The Vilter Mfg. Co., Milwaukee.



Koppers Piston Rings go 10 years without repair, replacement or oil waste!

Like Miller-Rasmussen Ice Co., you can reduce maintenance costs and time and increase operating efficiency with Koppers Industrial Piston Rings. You can profit from longer piston ring life . . . longer cylinder life . . . and eliminate piston ring feather, scoring and scuffing.

Koppers American Hammered Industrial Piston Rings prolong the lives of Diesel, gas, aircraft, gasoline and many other engines, valves and compressors. Rings range in diameter from 1 inch to 10 feet . . . are of cast iron and special alloy cast irons;

they may be chromium-plated for added durability.

Our field engineers in your area will be glad to unravel your knottiest piston ring problems and help provide you with a new high in piston ring performance. They'll check your present piston rings in operation . . . recommend the proper ring type . . . or even have a ring designed for your specific application.

Bring your piston ring problems to Koppers. Phone or write: KOPPERS COMPANY, INC., *Piston Ring and Seal Dept.*, 1604 Scott St., Balto. 3, Md.

Koppers Company, Inc.
Metal Products Division
Piston Ring and Seal Dept.
Engineered Products
Sold with Service



AMERICAN HAMMERED
Industrial Piston Rings

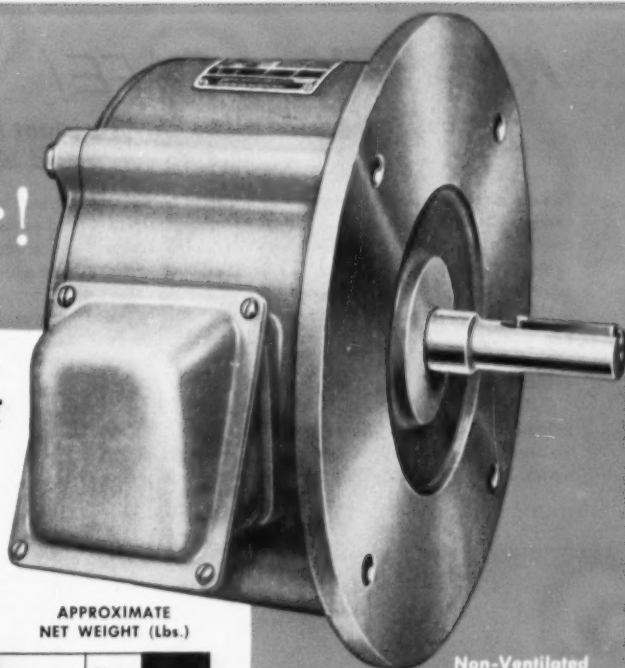
The Motor you asked for!

**TAKES less space ... because
it's the new FLAT-Type Motor**

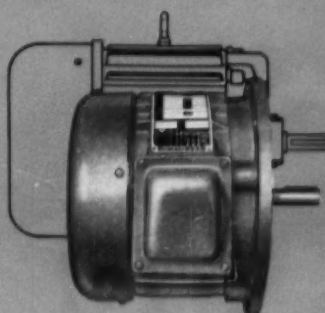
**GIVES more service ...
because it's a **DIEHL****

FOR SIZE AND WEIGHT, COMPARE THE
NEW FLAT-TYPE WITH STANDARD MOTORS

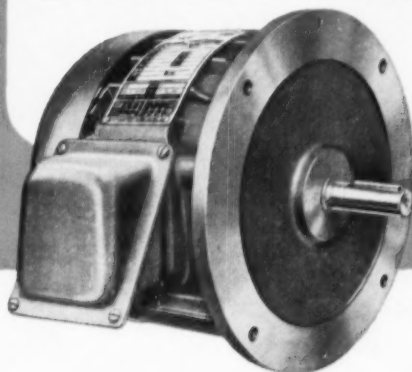
FRAME SIZE		OVERALL LENGTH (Inches)			APPROXIMATE NET WEIGHT (Lbs.)		
Standard	Flat- Type	Standard	Flat- Type	Saving	Standard	Flat- Type	Saving
DIF 182	DIF 180	14 $\frac{1}{16}$	10 $\frac{3}{4}$	3 $\frac{1}{16}$	82	59	23
DIF 213	DIF 220	17 $\frac{3}{16}$	11 $\frac{1}{16}$	5 $\frac{1}{16}$	128	83	45
DIF 284U	DIF 280	26	13 $\frac{1}{16}$	12 $\frac{1}{16}$	272	135	137



Non-Ventilated



New Flat-Type superimposed
on standard motor



Fan Cooled

The unique and perfect answer in *integral motors*—designed especially for the machine tool and equipment industries. Packs full horsepower in less space ... actually up to 48% shorter than standard motors without sacrifice in performance. Many pounds lighter, too, than conventional motors (over 50% in some cases), meaning vastly reduced over-hung weight. Standard radial construction, easy to disassemble and reassemble ... no precision

alignments or complicated air-gap adjustments to contend with. Totally-enclosed ... no dirt, dust or moisture can get in. Available (non-ventilated) in ratings to 3 H.P., and (fan-cooled) in ratings to 20 H.P.

Perhaps the Diehl Flat-Type Motor is just what you need to solve your application problems. Give us the details and we'll be glad to submit recommendations. Ask for your copy of Bulletin CA-3461.



DIEHL MANUFACTURING COMPANY

Electrical Division of THE SINGER MANUFACTURING COMPANY

Finderne Plant, SOMERVILLE, NEW JERSEY

ATLANTA • BALTIMORE • CHARLOTTE, N. C. • CHICAGO • CINCINNATI • DETROIT • MILWAUKEE • NEEDHAM, MASS. • NEW YORK • PHILADELPHIA • PITTSBURGH

MIGHTY...SAFE!

Navy adopts Cellulube* fire resistant hydraulic fluids to safeguard aircraft elevator systems

To minimize danger from fires and explosions that might hamper the operational efficiency of its great carriers, the U. S. Navy is now using Celanese* Cellulube 220, a straight chemical compound, as hydraulic fluid to activate deck-edge elevators.

Used for more than 1,500 hours aboard the Bennington, Shangri-La and Ticonderoga, Cellulube 220 is in service aboard the new Saratoga, and is also being evaluated for additional Naval applications.

Cellulube 220 is one of a series of synthetic (non-petroleum) functional fluids developed for industry by Celanese in six controlled viscosities. These fire-resistant hydraulic fluids and cylinder lubricants provide a sig-

nificant margin of safety wherever high temperatures and pressures may cause fire or explosion.

For additional information about the Celanese Cellulube series, write to Celanese Corporation of America, Chemical Division, Department 596 D, 180 Madison Avenue, New York 16.

In Canada, Canadian Chemical Company, Ltd., Montreal, Toronto, Vancouver.

DECK EDGE ELEVATOR TAKES PLANE TOPSIDE. Cellulube 220 is being used in elevators of this type on the Shangri-La, Bennington and Ticonderoga. The Navy plans to install fire-resistant hydraulic fluids on all carriers.



OFFICIAL U.S. NAVY PHOTOGRAPH



Basic reasons

Acids
Alcohols
Aldehydes
Anhydrides
Esters

Functional Fluids
Gasoline Additives
Glycols
Ketones
Oxides

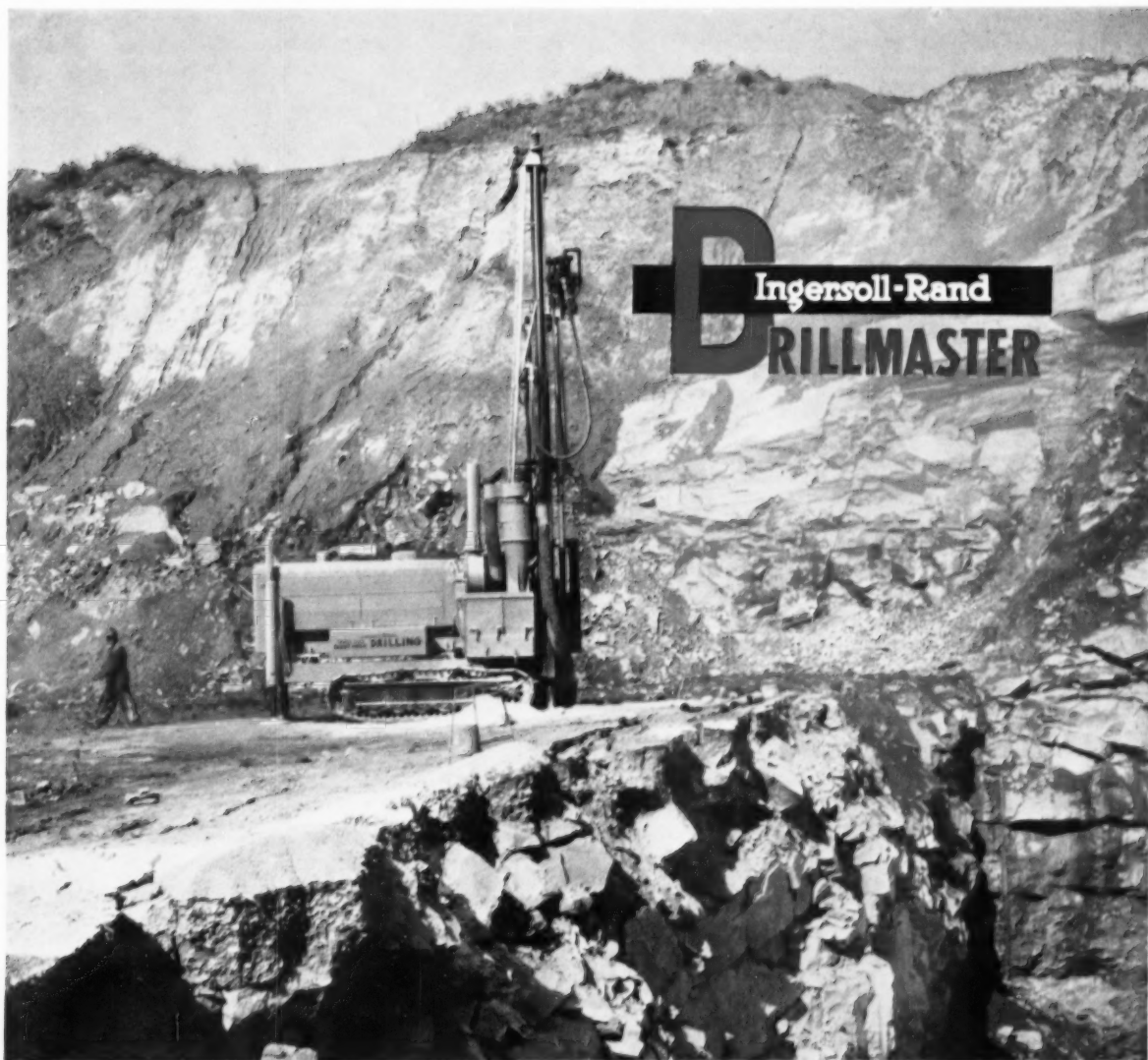
Polyals
Plasticizers
Salts
Solvents
Vinyl Monomers

Celanese
CHEMICALS

*Reg. U.S. Pat. Off.

..... for improved products

Agricultural, automotive,
aviation, building,
electrical, paper,
pharmaceutical, plastics,
surface coatings, textile.



4032 GROSS TONS PRODUCED DAILY!

SUPPLYING BLAST HOLES for three different quarries, the "down the hole" Depthmaster drill of the DRILLMASTER shown above is drilling limestone at a rate never before thought possible.

The formation is hard and very abrasive. Yet on a 50-foot face, the operator is sinking 180 feet of 6-inch holes per shift—on a 15-foot hole spacing pattern and 18-foot burden. That represents 4032 gross tons a day!

The Depth-Master "down the hole" drill actually goes down the hole with the bit. Applying full drilling impact directly to the bit, it eliminates the power losses in long drill steels. You can use the three-way DRILLMASTER also as a Rotary drill or as a Power-Master "out of the hole" drill.

Complete DRILLMASTER tower and accessories are available for tractor or truck mounting. For further details, write for Bulletin 4179.

5-387



Ingersoll-Rand

11 Broadway, New York 4, N.Y.

ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • PUMPS • OIL & GAS ENGINES

Better laundry service for hotel with *TIMKEN® bearings in compressor*

THE type 40 Ingersoll-Rand compressor pictured at the right supplies air for the laundry and machine shop of a large, modern hotel in Texas. It does a dependable job with minimum maintenance. One reason: Timken® tapered roller bearings are used on the crankshaft.

The tapered design of Timken bearings lets them take radial and thrust loads in any combination. Timken bearings keep the crankshaft in positive alignment, reduce wear on adjacent parts. And they carry heavy loads with ease. Full line contact between rollers and races of Timken bearings gives them load-carrying capacity to spare.

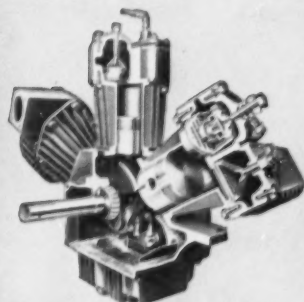
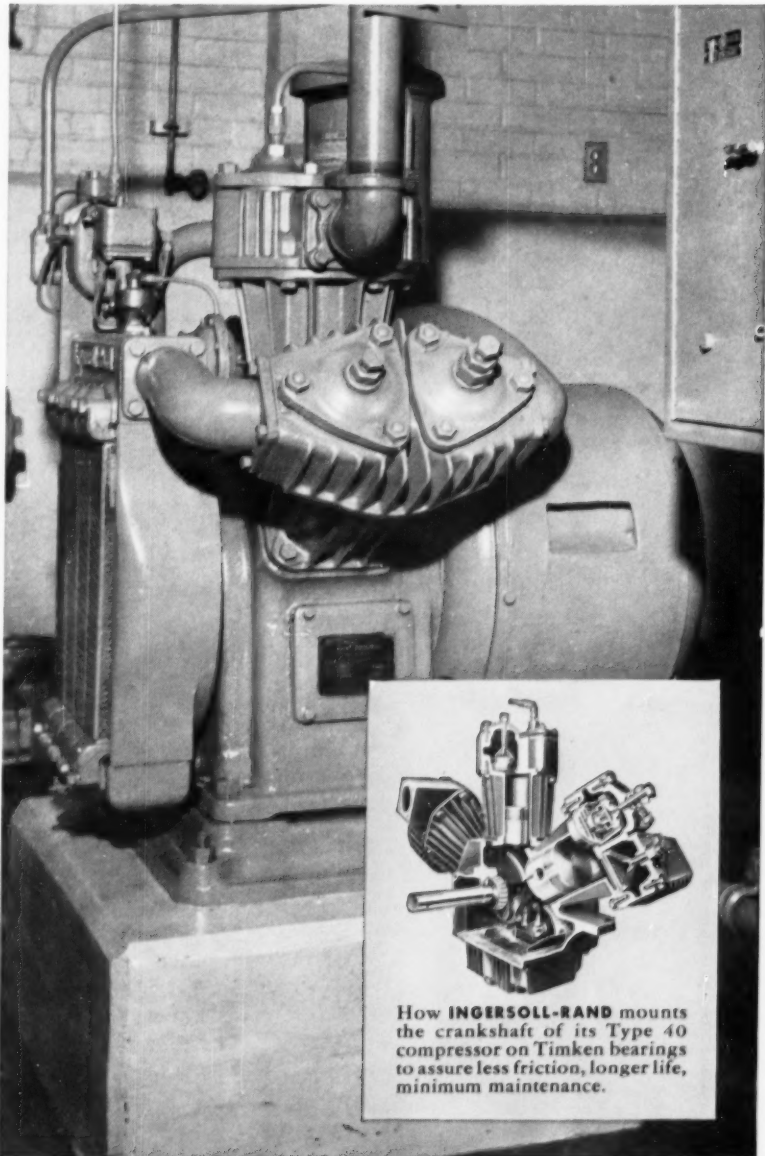
Timken bearings also help prevent costly maintenance delays. By holding housings and shafts concentric, they make closures more effective. Dirt and moisture stay out—lubricant stays in.

Timken bearings practically eliminate friction. They can because they're designed to roll true; and because they're made with microscopic accuracy to conform to their design. And as an extra quality precaution, we even make our own steel. We're the only U. S. bearing maker that does.

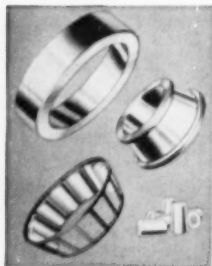
Always specify Timken bearings to make sure you get all these advantages in the equipment you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



*This symbol on a product means
its bearings are the best.*



How **INGERSOLL-RAND** mounts the crankshaft of its Type 40 compressor on Timken bearings to assure less friction, longer life, minimum maintenance.



DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Circle 44A on reply card